RISKY DECISION MAKING IN INVESTMENT: AN EXPERIMENTAL STUDY

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Dedication

This thesis is dedicated to my precious son, Muhammad Aqib Abbas Zaidi loving husband, Wasif Abbas Zaidi and beloved parents, Dr. Nayyar Raza Zaidi and Farzana Batul Zaidi.

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Abstract

The research investigates why some individuals make better decisions in risky investments than others and what individual/socio-demographic characteristics influence in making these decisions. Three research questions with nineteen hypotheses were developed for the investigation. The first research question was (RQ1) Which demographic factors (gender, age, ethnicity, education, and investment experience), decision making styles and personality traits affect financial risk tolerance, financial literacy and risky decision making? Second research question was (RQ2) Is there any significant relationship between financial risk tolerance, financial literacy and risky decision making? And the third and last research question was (RQ3) Which combination of demographic factors (gender, age, ethnicity, education, and investment experience), decision making styles and personality traits predict financial risk tolerance score and financial literacy score? The investigation included two risky decisions making experimental tasks i.e. Iowa gambling task (IGT) and the balloon analogue risk task (BART) and an online questionnaire in which 244 UK respondents participated. The participants included professional (71%) and nonprofessional (29%) investors. Mixed factor ANOVA, one Way ANOVA, Pearson correlation and multiple regression were used to analyse the data. (RQ1) There were no significant differences in the gambling task performance based on financial knowledge, investment experience, personality traits and demographics. There were significant differences in basic and advanced financial literacy based on gender, age and investment experience. (RQ2) The results of the mixed factor ANOVA showed that there was no significant main effect of financial risk tolerance on the Iowa gambling task performance but a significant interaction was found to be present. Thus, financial risk tolerance high or low does not affect the risky decision-making task performance. The results of mixed factor ANOVA results show that same level of perceived financial knowledge and actual financial

literacy was significantly related to better performance on the Iowa gambling task. Therefore, overconfidence or under confidence about one's level of financial understanding affects performance on risky decision-making tasks. (RQ3) 28% variability in the financial risk tolerance score is explained by the predictors gender, financial literacy score, spontaneous decision style, extraversion and investment experience. The regression model showed that gender, financial risk tolerance score, rational decision making, intuitive decision making, and investment experience cause 38% variability in financial literacy score.

The participants did learn to make better selections in the gambling task but still majority 56% of them displayed impaired performance. Based on the findings of the research it is recommended that the importance of financial literacy and investment experience should be considered when the financial consultants prepare the investors profile. It is also recommended that the assumptions for measuring healthy performance on the Iowa gambling task should be evaluated carefully when applied to healthy participants in such a way that the individual differences are also incorporated.

Key Words: Financial Risk Tolerance, Financial Literacy, Perceived Financial Knowledge, Iowa Gambling Task, Balloon Analogue Risk Task, Investment Experience, Decision Making Styles, Big Five Personality Traits

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1 Chapter One: Introduction

1.1 Introduction of the Study

Behavioral Finance as opposed to traditional finance considers the contribution of psychology in explaining mental processing of human beings in order to understand financial decision-making process. The normative approach of decision making suggests risk as being an essential element of decision making from Expected utility theory to the modern Portfolio theory. While the behavioral economics paradigm from prospect theory to behavioral portfolio theory presents a descriptive approach of decision making which is influenced by cognitive biases as opposed to rational decision making. The third approach of 'risk as a feeling' suggests that decision making is influenced by emotions in situations of uncertainty. Risk perception is influenced by not only the characteristics of risk but also by the emotional state of the perceiver (Lucarelli and Brighetti, 2011).

The decision-making process of an individual is not only about the rational process it also is influenced by the individuals personality traits, decision making style, the level to which the person is willing to take risk (financial risk tolerance), the level of understanding of the individual about the financial instruments stocks, bonds, mutual funds, how he/she can diversify the risk all these factors (financial literacy) as well as the individuals prior experience in making investments (investment experience). Along with these factors perception of one's knowledge also does to some extent influence good or bad decisions. If a person thinks he/she knows more than he/she actually does meaning, he/she is overconfident may negatively affect the decision making. On the other hand, the same will be the result of being less confident about one's level of knowledge and actually being more knowledgeable/literate. Therefore, in order to understand risky decision making this

research focuses on the effect of financial risk tolerance, financial literacy, perceived financial knowledge and investment experience on the risky choice tasks which imitate real world decision making.

Real life financial investment decisions involve both ambiguity and uncertainty therefore using behavioural risky investment tasks such as Iowa gambling task (Bechara et al., 1994) and balloon analogue risky task (Lejuez et al., 2002) can provide us with useful insight as to how financial risk tolerance, investment experience and financial knowledge play a role in making better financial investment decisions.

1.2 Statement of the Problem

The main idea of the research is to understand not only the outcome of the risky decision-making task but to try and discover why some individuals make decisions which are better than others and what individual characteristics they have. This is important so in order to improve decision making if it is identified that financial literacy is a factor which helps to make better or advantageous decisions then it can be recommended to policy makers that there should be ways to improve financial education at different levels which will in turn increase financial literacy of the residents of United Kingdom and this will help them to make better financial decisions.

1.3 Research Questions

The main research questions that were aimed to answer are as follows:

1. Which demographic factors (gender, age, ethnicity, education, and investment experience), decision making styles and personality traits affect financial risk tolerance, financial literacy and risky decision making?
2. Is there any significant relationship between financial risk tolerance, financial literacy and risky decision making?

3. Which combination of demographic factors (gender, age, ethnicity, education, and investment experience), decision making styles and personality traits predict financial risk tolerance score and financial literacy score?

For each main research question, a number of sub research questions were formulated which are given below:

RQI: Which demographic factors (gender, age, ethnicity, education, and investment experience), decision making styles and personality traits affect financial risk tolerance, financial literacy and risky decision making?

RQ1: Is there any significant relationship between demographic factors, personality traits, decision making styles and financial risk tolerance?

RQ2a: Are there significant differences in financial literacy scores (basic and advanced) based on gender, different age groups, level of education, investment experience?

RQ2b: (i) Are respondent's perceived financial knowledge and actual financial literacy significantly related to gender? (ii) Is there any significant association between perceived financial knowledge and different age groups? (iii) Are there significant differences in actual financial literacy among different age groups? (iv) Is there significant relationship between perceived financial knowledge, actual financial literacy and level of education, investment experience?

RQ3a: Is there significant relationship between personality traits, decision making styles and financial literacy (basic and advanced)?

RQ3b: Are there significant differences in personality traits and decision-making styles based on the perceived financial literacy level?

RQ4: Are the demographic variables, decision making styles, personality traits related to the Iowa gambling task performance?

RQ5: Does the performance of individuals on the Iowa gambling task differ significantly based on the investment experience?

RQ6: Do the personality traits differ based on the investment experience a respondent has?

RQ7: Do the number of explosions and average number of pump count significantly differ among the demographic variables (gender, age, ethnicity, education)?

RQ8: Are there significant differences in the performance of Iowa gambling task of professional investors and students?

RQII: Is there any significant relationship between financial risk tolerance, financial literacy and risky decision making?

RQ1: Are there significant differences in basic and advanced financial literacy based on financial risk tolerance categories?

RQ2: Are there significant differences in financial literacy score based on financial risk tolerance categories?

RQ3: Are there significant differences in financial risk score and financial literacy score based on perceived financial knowledge?

RQ4: Are there significant differences in the performance of Iowa gambling task in the final blocks based on financial risk tolerance categories

RQ5: Are there significant differences in the risk taking behavior (number of explosions and average number of pump counts) among the financial risk tolerance categories?

RQ6: Is there significant relationship between basic and advanced financial literacy and the Iowa gambling task variables?

RQ7: Is there significant differences in Iowa gambling task performance based on level of perceived financial knowledge and actual financial literacy?

RQ8: Is there significant relationship between basic, advanced financial literacy and number of explosions, average number of pump counts (BART variables)?

RQ9: Are the number of explosions, average number of pump counts significantly related to financial knowledge and financial literacy?

RQIII: Which combination of demographic factors (gender, age, ethnicity, education, and investment experience), decision making styles and personality traits predict financial risk tolerance score and financial literacy score?

RQ1: Which combination of demographic variables, personality traits and decision-making styles predict financial risk tolerance score?

RQ2: Is there a combination of demographic variables, personality traits and decision-making styles that predicts financial literacy score?

1.4 Research Design

The research design was both 'Survey Design' and "Experimental Design" and data collection was done using laboratory experiments. The research method was "Quantitative Method" which relates with the "Positivist" and empiricist research philosophy and thus a deductive approach was used. The deductive reasoning was applied as financial risk tolerance which is a concept related to behavioural finance theories was hypothesized to be related to socio demographic variables as well as the risky decision making. Therefore, the research process started from the theoretical framework which was based on the literature review then the hypotheses were formulated, the measures including questionnaires, experimental tasks were decided, data collected through Pureprofile, data analysed and lastly interpretation of the results was done. This research process centred on deductive reasoning and method used was hypothectico-deductive method (Sekaran and Bougie, 2009).

1.5 Theoretical Framework

The main focus of the research was to understand investor decision making under uncertainty and risk. The importance of measuring financial risk tolerance is there because behavioral finance considers risk to be subjective and it differs from one individual investor to another. Among the theories of financial decision-making prospect theory is a behavioral finance theory and the concept of loss aversion given by Daniel Kahneman and Amos Tversky is also considered to be very relevant in measuring financial risk tolerance score. This is why the instrument devised by Grable and Lytton (1999) has two items based on loss aversion. The following section gives the comparison of behavioural finance and traditional finance after which the main theories of financial decision making are discussed including the prospect theory and finally some relevant research related to the field of decision making are mentioned.

1.5.1 Decision Making in Traditional and Behavioral Finance

In finance to understand decision making different theories were presented and tested by researchers' overtime which led to emergence of new disciplines which study decision making from a different perspective and use different technologies. The standard finance is based on the assumption that investors make rational choices and the decisions are taken according to the expected utility theory under certainty. In fact, investors don't take rational decisions always. Behavioural finance is the field which considers the psychological and sociological perspectives to understand and explain how emotions affect investor decisions. It challenges the efficient market hypothesis and considers that there are limits to arbitrage (Vasile and Sebastian, 2007).

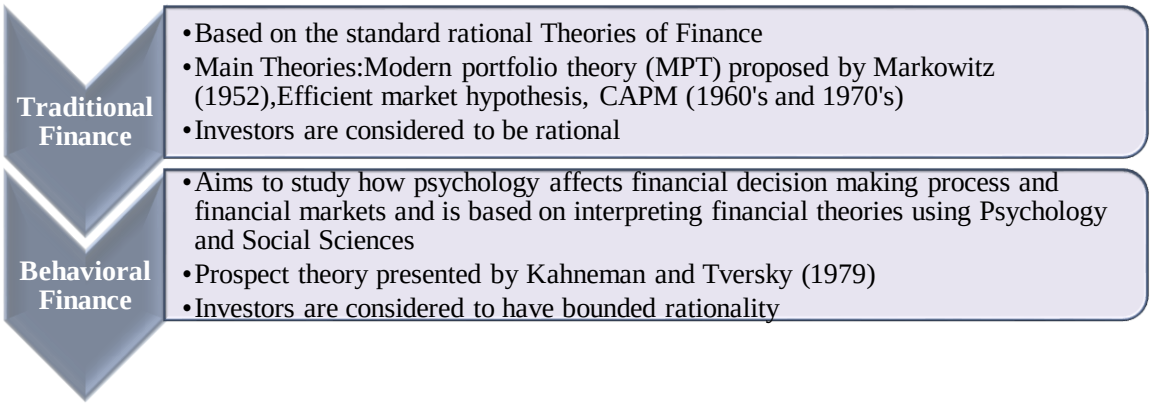

Figure 1.1: Comparison of Traditional and Behavioural Finance Source: (Gippel, 2013a) and (Sahi, 2012a)

1.5.1.1 Behavioral Finance

Behavioural finance is a field of study that incorporates elements of cognitive psychology into finance in an effort to better understand how individuals and entire markets respond to different circumstances (Brigham and Houston, 2008).

Behavioural finance as defined by Ricciardi (2008) is a discipline that explains and increases understanding that how the decision-making process is influenced and affected by cognitive errors (mental mistakes) and emotions of investors. It integrates the concepts of psychology, sociology, and other behavioural sciences to explain individual behaviour. Behavioural finance unlike the traditional finance considers that the agents (i.e. investors) can also have some preferences and mistaken beliefs as opposed to always being rational (Ritter, 2003).

Risk is defined and perceived differently in both traditional and behavioural paradigms. Traditional finance perceives risk to be objective and in the external world independent of individual cultures, minds and can be easily measured. On the other hand, behavioural finance considers risk to be subjective i.e. differing from individual to individual. Behavioural finance takes a multidimensional approach of measuring risk taking into account knowledge and cognitive capacity in addition to factors considered by traditional

finance. Lastly the individual decision maker is the focus of the behavioural risk research thus adopts a microeconomic perspective while in traditional finance the macro perspective of risk is considered (Lucarelli and Brighetti, 2011).

In behavioural finance the individual risk perception and attitude towards risk is very important to understand the differences in financial decision making. Financial risk tolerance is a very important factor that influences decision making and thus must be taken into account while studying and exploring individual decision making.

Behavioral Finance Vs Efficient Market Hypothesis: Behavioural Finance is a paradigm which has two dimensions' cognitive psychology (how people think) and the limits to arbitrage (when markets behave inefficiently). Unlike the earlier models' behavioural finance uses models in which the agents (i.e. investors) can also have some preferences and mistaken believes as opposed to always being rational. EMH considers that markets are rational and make unbiased forecasts about future while behavioural finance says that sometimes markets can also be inefficient (Ritter, 2003).

Bounded Rationality: The base of the EMH is the rational behaviour of the participants. Rationality as defined by Simon (1972, p.161) is

"Rationality denotes a style of behaviour that is appropriate to the achievement of given goals, within the limits imposed by given conditions and constraints". In conditions of risk and uncertainty people don't always behave rationally and this concept is known as bounded rationality (Simon, 1972). Before the appearance of the concept of bounded rationality in Herbert Simon's work related terms like limited intelligence (1840), "finite intelligence" (1880), administrative and approximate rationality were used in researches to mention the limits to rationality (Matthias Klaes and Esther-Mirjam Sent, 2005).

The requirement of being fully rational is to have full cognitive capabilities. Bounded rationality is the rational choice made to account for the decision maker's cognitive limitations. Bounded rationality considers that the decision maker has limitations of knowledge and computational capacity (Tseng, 2006).

Limits to Arbitrage: Arbitrage is using the misevaluations of financial assets and making abnormal profits. There are two types of events high frequency and low frequency events. High frequency events occur often and low frequency events take place once in a while but have long term effects. Low frequency events don't support market efficiency and examples include undervaluation of stock markets (1974-1982), Japanese (1980's) and Taiwanese (1990) stock market bubbles, October (1987) stock market crash and the telecom bubble of (1999-2000). The application of behavioural finance can be understood by considering that due to framing equities are normally undervalued and IPO's under-priced (Ritter, 2003).

1.5.2 Theories of Financial Decision making

1.5.2.1 Efficient Market Hypothesis

Efficient market hypothesis is one of the main theories of neoclassical finance. The efficient market hypothesis evolved from the random walks theory given by Paul Samuelson (1965) in the 1960's. Random walks theory is about the movement of stock prices and it implies that stock-price fluctuations over time are independent and can be described as a random process. This theory is very important for investors, economists, and financial researchers. The theory suggests that the previous market-price patterns have no effect on the current market price of a stock. It implies that the market is efficient and no systematic over-valuations or under-valuations of stocks are there. There are many rational investors who have sufficient resources and are able to take advantage of the profit opportunities present (Van Horne and Parker, 1967).

Three main assumptions are the basis of the efficient market hypothesis. The first assumption is that the market has participants which are rational and they value the securities rationally. The second assumption is that even if some investors are not rational their trading actions will either be cancelled out or arbitraged away by the actions of the rational investors. Lastly the investors have an objective of maximizing their utility (Tseng, 2006). There are three forms of market efficiency weak, semi-strong and strong form. The weak form suggests that the prices fully reflect the historical information so the investors cannot get abnormal profits. The semi-strong form suggests that the prices reflect both the historical as well as public information regarding the market. The strong form suggests that the prices reflect all information held by market participants (Malkiel, 1989).

Fama (1998) in his study justified that the markets are efficient and challenges the literature on long term return anomalies. Overreaction and under reaction are only chance results and pre-event abnormal returns are as frequent as the post- event reversal. The researcher thinks that in the studies that advocate under reaction and over reaction the random sample of events are considered, sensitivity to alternate hypothesis problem is not shown and the researchers seem to be biased in their approach. Some anomalies might be generated due to rational asset pricing. The anomalies when viewed separately are shaky and disappear when different ways are used to measure them. The conclusions drawn from his study is that the behavioural models do not provide such evidence that can be used to abandon the market efficiency.

1.5.2.2 Expected Utility Theory

The expected utility theory was originated by Bernoulli (1738) and Morgenstern and Von Neumann (1944) considered utility under uncertainty afterwards. Expected utility as given in the expected utility theory is the product of the probability and subjective utility of a goal (Zhang and Hirsch, 2013). Bernoulli (1738) in this normative theory of decision making

suggested that when the choice between uncertain alternatives is made the lottery with highest expected utility is chosen as compared to the lottery with highest expected value. The expected utility theory is based on the rational behaviour of the decision makers. The utility function described in the theory has two important characteristics. Firstly it considers the risk attitude of the decision maker and secondly it considers the attitude of the decision maker towards the certain outcomes (Heim, 2010).

1.5.2.3 Modern Portfolio Theory

Modern portfolio theory (MPT) proposed by Markowitz (1952) was based on the expected utility theory. MPT suggested how the rational investors should make their portfolio selection decisions based on the parameters of expected reward and variance and in order to optimize the portfolio the risk should be diversified away. The theory does not explain how the real-life investment decisions are taken where the investors don't consider the expected utility. The prospect theory and behavioural finance explain certain decisions of investors when they deviate from rational behaviour (Sahi, 2012b).

1.5.2.4 Prospect Theory

Experiments and examples show that judgments or decisions made by people or investors can be sometimes influenced by "biases" or "mistakes". Such examples were experimentally tested by Daniel Kahneman and Amos Tversky. The findings of these and leading experiments were at odds with the classical theory. The prospect theory given by the researchers suggests that people treat gains and losses differently. Investors are loss averse meaning that they perceive a loss of a given amount of money to be more painful as compared to a gain of the same amount (Gilboa, 2010). The value function given by them has three main features. The first feature is that the value function is defined on basis of gains and losses as opposed to final asset positions. The second feature is that the marginal value of the gains and losses decrease with their magnitude and the third feature is loss

aversion. Loss aversion is expressed by Kahneman and Tversky (1979, p. 279) as: "The aggravation that one experiences in losing a sum of money appears to be greater than the pleasure associated with gaining the same amount". It is a very important theory which was generalized into the "Cumulative Prospect Theory" (Sahi, 2012c).The CPT also assumes that the individuals make decisions in order to maximize the value of utility function depending on gains and losses.

1.5.2.5 Adaptive Market Hypothesis

As the EMH is based on the assumption of rational investors the adaptive market hypothesis AMH given by Lo (2004) considers the theory of cognitive psychology, neuroscience and socio-biology in order to provide a theoretical framework which incorporates the market efficiency along with its alternative behavioural theories (Gippel, 2013b). According to this theory the behavioural biases are frequently observed in the market to affect the decision making, the risk and return relationship changes over time. The investor optimizing behaviour is based on trial and error and the decision making is guided by developing heuristics using the past and present experiences. When time passes, the older heuristics are replaced by using behavioural biases and developing new heuristics. The decision making of investors keeps on changing by making adjustments and adaptations (Tseng, 2006).

The research had four main research questions which are divided into further sub questions from which the hypotheses were drawn. Chapter three consists of the detailed theoretical framework and hypotheses which were divided into two parts. It is divided into two parts the first part is based on the theoretical framework for financial risk tolerance and relevant hypotheses. This theoretical framework was developed to answer the first and second research question and thirteen hypotheses were developed for the purpose of analysis. The second part gives the theoretical framework for the second main independent variable

financial literacy and the hypotheses with relevant literature related to them. In order to answer the third and fourth research question the second theoretical framework and nineteen hypotheses were developed nine were related to basic and advance financial literacy and ten were related to perceived financial knowledge and actual financial literacy.

1.5.3 Decision Making Under Uncertainty and Risk

The state in which the decision maker is not sure about the outcome of making a certain choice is called uncertainty. According to Benjamin Franklin only two things are certain in life are death and taxes. The distinction between decisions under uncertainty and decisions under risk was made by economist Frank Knight (1921). A risky decision is such a decision about which the mathematical probabilities of the possible outcomes are known to the decision maker. While in case of an uncertain decisions the possible outcomes cannot be expressed as mathematical probabilities (Glimcher et al., 2008).

Uncertain decisions were for long considered to be based on cognitive processes but new researches in judgment and decision making (JDM) have also considered emotional processes to be important. Cognitive processes involve mathematical calculations and are exact while emotional processes involve approximations and heuristics. But because both cognitive and emotional processes are related to brain they cannot be distinguished like this (Quartz, 2009).

In uncertain environments, most of the times “gut feeling” also known as intuition can be the way financial decisions are taken. Intuitive decision making has become very important because as the complexity of the decision increases intuition is more likely to guide the financial executive’s decisions as compared to rational analysis.

A research paper by (Hensman and Sadler-Smith, 2011) through qualitative research aimed to add to the conceptual and theoretical knowledge of the field. The data was gathered through semi-structured in-depth interviews of financial executives of one banking

organization ‘FinCorp’. Fifteen highly experienced executives were interviewed for an hour. The findings of the research suggest that executives try to combine both intuition and rational analysis when making decisions as opposed to solely relying on intuition.

In other research conducted by Causse et al. (2011), laboratory experiments were used for understanding decisions under uncertainty. 19 aeronautics students were recruited for participation in the experiment. The experiment involved manipulation of uncertainty and reward. During the experiment, the Heart rate (HR) changes were measured to get information about the cognitive and emotional state of the participants. The conclusions drawn from the study are that cold reasoning is analytical and objective while the hot reasoning was influenced by incentive at the cost of safety.

1.5.4 Investor Decision Making

The investment decision process has three stages; first is the analysis and seletion of the stiockes whichare avaible for the current investment. The second stage is to formulate an investemtn policy and finally the third step is the selection of the stocks which make the portfolio. Whenever some investment is made because the outcome is not certain literature shows that emotions effect decisions. Real life decisions as compared to laboratory tests show that traders are dealing with their own money and their moods do change throughout the day. The investors give the credit of success to their own skills and the losses are the result of the external factors. Time orientations can be considered to keep a balance between cognition and emotion. The past experiences can guide decisions but the most important thing is to identify which past event resembles the crisis which is faced by the organization presently. The present orientation considers millions of events and clusters their similarities. The orientation that not only considers past but uses it for future prediction is called future orientation. The present view is the orientation that is most commonly used for financial decisions (Pixley, 2010).

A study by Gambetti and Giusberti (2012) concluded that emotions strongly influence investment decisions and are also linked with risk preferences. In demographic variables experience is the one which mostly predicts investment decisions. The anxious investors are over cautious when making investment decisions while the investors with anger trait take risky but "better decisions" in terms of returns.

To understand the behavioural rules in Foreign Direct Investment (FDI) location decision a database was developed using information, interviews and questionnaires filled by managers of 50 Portuguese firms. The Heiner model was used to explain the uncertainty faced by managers while making decisions influenced by behavioural rules. When an investment is made by rational managers they mainly are concerned to minimize the cost as compared to the revenue. According to neoclassical approach FDI location decisions are based on cost benefit analysis while the behavioural approach says that this decision is taken keeping in mind the psychic distance. The model considers that managers when face uncertainty a gap arises between the "difficulty" and their "competence" which leads to the use of behavioural rules in decision making. The managers who participated in this study were responsible for taking 76% of the FDI decisions175 situations were identified where managers used behavioural rules when they were to make investment decisions abroad. 55% locations chosen by Portuguese managers were influenced by behavioural rules. So it was concluded that not only profit maximization but other factors such as investment by other managers, past experiences of firms or society also can guide the investment decision (Pinheiro-Alves, 2011).

There is substantial difference in the investment portfolios among different individuals and understanding this heterogeneity is a very relevant but not settled debate in finance. The studies conducted considering different genetic factors influencing the financial decision

making have been conducted in the recent years to understand how genetic variations affect decision making.

A research by Cesarini et al., (2010) was conducted to explain the heterogeneity in portfolio risk through genetic variation. The participants were asked to construct a portfolio of five funds from a large menu of 500 funds. The survey was administered between November 2005 and March 2006 to all Sweden born twins between 1959 and 1985 and had a response rate of 60%. The data was collected following a major pension reform in Sweden. The results of this study showed that 25% of the individual differences in portfolio risk related to the investment decisions were due to genetic variation. Thus the study suggests that the genetic markers can help to understand why different individuals have difference in their willingness to take risk.

Another study on Wall Street traders was conducted to determine the genetic factors which contributed to their success. For this research 60 New York City successful stock traders were genotyped. The traders were intermediary traders who bought and sold securities for their clients. For comparison purposes 54 students from Claremont Graduate University were chosen as participants. Saliva samples of all participants were collected using Oragene DNA kit and genomic DNA was purified. The main aim of this study was to identify genetic alleles which if active in brain contribute to success in finance. The alleles of COMT and DRD4P were predominant and associated with traders as compared to the students. The results showed that successful traders consider risk in comparison with reward and avoid high risk. More experienced traders usually are less emotional than less experienced ones. This study of personality and genes shows that successful traders are analytical, integrative and delay gratification. They also don't take extraordinary risk and have a long term perspective about things (Sapra, et al., 2012).

1.6 Major Contributions and Implications

This study not only investigates how different levels of financial risk tolerance, financial literacy, investment experience relate to one another but also how they affect decision making in laboratory tasks which are close to real life decision making. The research also focuses on how perceived or self-reported financial knowledge also referred to the level of confidence one has in his/her financial understanding and actual financial literacy are related to task performance. Financial risk tolerance, financial literacy and investment experience were found to be significantly related to each other thus implying that high financial literacy is related to more investment experience and high financial risk tolerance. The respondents who were more experienced, had high financial literacy and high financial risk tolerance did not differ in task performance from the less literate, less experienced and less risk tolerant individuals. It was found that same levels of perceived financial knowledge and actual financial literacy are related to better decision making. The balloon analogue risk task was found not to be significantly related to any variables including financial risk tolerance, financial knowledge, financial literacy, investment experience, personality traits and decision-making styles but were found to be related to demographic variables including age, ethnicity and employment status.

1.7 Scope and Significance of the Research

The data for the research was collected using online questionnaire and experimental tasks presented using two software's Qualtrics and inquisit. The sample population was United Kingdom from where the respondents which had at least little financial knowledge completed the survey and tasks.

There has been no research conducted to our knowledge which focused on the relationship of financial literacy and risky decision making and apart from the research by Lucarelli and

Brighetti (2011) no other study has explored the relationship of financial risk tolerance and risky decision making. But in their study the self-reported measure Barratt impulsivity scale was used as a measure of impulsivity. We used behavioural measure of risk taking Balloon Analogue risk task (BART) which measures the risk-taking dimension of impulsivity.

The self-reported measures may not be as accurate as the individuals know that they are providing information to other people as compared to the behavioural measures which are more objective and less susceptible to being biased (Cheng et al., 2012).

1.8 Organization of the study

The thesis is divided into six main chapters the first chapter is introduction of the study including the research questions, scope and significance of the research, major contribution and organisation of the thesis. The second chapter includes the literature review of the main independent variables financial risk tolerance, financial literacy as well as the risky decision-making tasks i.e. Iowa gambling task (IGT) and balloon analogue risk task (BART). The third chapter of the thesis is research methods and data collection which covers the research design, research methods, measures and the details of the coding and analysis. The fourth chapter is of analysis and results which is divided into three main parts according to the three research questions and their sub hypotheses. The fifth chapter summarises the findings of the research and also gives the discussion of the findings in light of the previous researches and the similarities and differences this study has with them. The sixth and last chapter is about the conclusion of the thesis which summarises the findings and implications focusing on financial risk tolerance and financial literacy. Limitations of the study and future scope of research are also discussed in this final chapter. The first chapter research questions were formulated based on the literature review discussed in chapter 2. The third chapter gives the research methods used to answer the

research questions converted into hypotheses which were stated in the same chapter. The forth chapter gives the results of the tested hypotheses and the fifth chapter discusses the findings of the hypotheses and the last chapter concludes the findings of the study.

1.9 Conclusion of the Chapter

The chapter provided the introduction of the research, gives the research questions that were used to derive the hypotheses, theoretical framework and scope and significance of the research were also explained.

2 Chapter Two: Literature Review

2.1 Introduction of the Chapter

This chapter reviews in detail the research that has been done previously for the main variables financial risk tolerance, financial literacy and the experimental tasks Iowa gambling task and balloon analogue risk task as well as personality traits and decision making styles.

2.2 Financial Risk Tolerance

2.2.1 Definition

Risk tolerance is 'The degree to which an investor is willing and able to accept the possibility of an uncertain outcome to an economic decision. A measure of risk tolerance is useful in summarizing an investor's perception about the tradeoff between risk and the compensation required for bearing risk' (Harlow and Brown, 1990, p. 51).

Financial risk tolerance is defined as 'the maximum amount of uncertainty that someone is willing to accept when making financial decision' (Grable, 2000, p. 625). The projection bias[1] combined with regret theory[2] can be used to understand the concept of financial risk tolerance from a behavioural finance perspective. Investors want to avoid feeling of regret arising from loss and regret outweighs the feeling of joy. Thus with changing stock market

[1] The individual's tendency to use the current events to project into the future is known as projection bias. The evidence of the projection bias has been found in studies to investigate the risk taking of youth and adolescents (Grable et al., 2004).

[2] Regret theory suggests that individual investors try to reduce feelings of regret in uncertain and risky situations. The regret theory helps us to understand the elasticity of financial risk tolerance (Grable et al., 2004). As described by (Landman, 1987, p. 820) 'Regret theory rests on two fundamental assumptions: first, that many people experience the sensations we call regret and rejoicing; and second, that in making decisions under uncertainty, they try to anticipate and take account of those sensations'.

conditions the investor risk tolerance also changes and is therefore elastic (Grable et al., 2004).

2.2.2 Demographics and Financial Risk Tolerance

The relationship between different demographic variables and financial risk tolerance has been explored by numerous studies. The evidence suggests that demographics including gender, age, income, marital status, education are most important to be considered. Females are found to have low risk tolerance as opposed to male individuals (Grable, 2000; Anbar and Eker, 2010; Ryack, 2011, Sulaiman, 2012, Gibson et al., 2013; Wong and Carducci, 2013; Kannadhasan, 2015).

Age was reported (Grable, 2000; Finke and Huston, 2003; Anbar and Eker, 2010; Sulaiman, 2012; Gibson et al., 2013; Kannadhasan, 2015) to have a relationship with risk tolerance. The older individuals as compared to younger ones have lower risk tolerance. Some researchers ((Anbar and Eker, 2010) and (Wong and Carducci, 2013)) however have found no relationship of age and risk tolerance.

The individuals with higher annual incomes normally have higher risk tolerance as shown by researches by (Grable, 2000; Anbar and Eker, 2010; Sulaiman, 2012; Gibson et al., 2013). While some studies found no relationship such as (Kannadhasan, 2015). Marital status is also a demographic which effects risk tolerance as single individuals are more risk tolerant as compared to married ones (Grable, 2000; Anbar and Eker, 2010; Sulaiman, 2012; (Kannadhasan, 2015)) but some researchers found no relation (Anbar and Eker, 2010). Education was found to effect risk tolerance level in individuals (Ryack, 2011; Sulaiman, 2012; (Kannadhasan, 2015). As the number of dependents increase the risk tolerance level decrease as reported by Anbar and Eker (2010) and Sulaiman (2012). Gibson et al. (2013) found that investment knowledge, positive expectations about the stock market and using a financial advisor was positively related to financial risk tolerance.

Ryack (2011) studied the influence of parent's risk tolerance on children and spouses risk tolerance on males and females the results showed that spouses risk tolerance effect risk tolerance levels. Wealth is also related to risk tolerance of individuals as shown by the results of Finke and Huston (2003) and Hallahan et al. (2004). The other variables leading to high risk tolerance include professional occupation (Grable, 2000; Anbar and Eker, 2010) and high net assets (Grable, 2000; Finke and Huston, 2003; Anbar and Eker, 2010).

A longitudinal study by Van de Venter et al. (2012) investigated the annual change in financial risk tolerance scores of individuals over a 5 year period and the factors that influence such change. The results of the research indicated that there is a small annual change in individuals' financial risk tolerance. A decrease in household size and terminating the services of a financial planner were the only two factors which significantly explain an annual change in financial risk tolerance.

In a study conducted by Gibson et al. (2013) investigated risk tolerance scores of more than 2,000 individuals and found a positive relationship between risk tolerance and income, investment knowledge and positive stock market expectations. Risk tolerance was found to be lower for females, older individuals and for those individuals that currently use a financial advisor.

Another study by Sweet (2013) also suggested that gender and income are the factors that have a significant relationship with financial risk tolerance. It was also recommended by the researchers that financial advisors regularly examine the financial risk tolerance of all their male clients and pay particular attention to changes in income levels as men are more sensitive to changes in income than women.

According to a study by Cooper et al. (2014) women have lower scores for risk attitude and knowledge, while as compared to men their risk capacity and propensity is not statistically

different. A study by Lin and Lu (2015) explored the psychological and socio-demographic factors of bettors concluded that bettors with extroversion, openness, and agreeableness had higher risk tolerance.

Lemaster and Strough (2014) used psychological dimensions of gender to explore the gender differences in risk tolerance. Gender identification, gender typicality and personality traits stereotyped by gender were the measures considered. The women who identified more with their gender and men who identified less with their gender were more risk tolerant.

2.2.3 Financial Risk Tolerance and Financial Literacy

Beal and Delpachitra (2003) found that risk preference which may be indicating less financial experience is negatively related to financial knowledge. The results of a research conducted by Cameron et al. (2014) showed that the students with lower financial risk tolerance are more likely to apply financial literacy when making decisions as compared to students with high risk tolerance.

2.2.4 Financial Risk Tolerance and Iowa gambling task performance

Financial behavior can be influenced by the emotional state and feelings of the individual as well. The experimental task designed by Bechara et al. (1994) showed that the individuals who could experience emotions played differently from the individuals who could not experience emotions while making decisions. It has been found that healthy patients such as risk seekers also demonstrate inability to make use of emotions and thus perform similar to the patients with ventromedial prefrontal cortex lesions. The participants who could not experience emotions followed a high risk strategy as opposed to the participants who could experience emotions followed a risk averse strategy (Lucey and Dowling, 2005).

Lucarelli and Brighetti (2011) utilised three measures including unbiased risk tolerance, biased risk tolerance and actual financial choices was to explore the emotional side of risk taking. The sample size was of more than 440 individuals including traders and asset managers. The unbiased risk tolerance was measured by the Iowa gambling task and the biased risk tolerance using the financial risk tolerance questionnaire. The gambling task is a behavioural measure of decision under uncertainty while the financial risk tolerance questionnaire is biased measure because it is a self-reported measure. The results indicated that the respondents showed higher unbiased risk tolerance than the biased risk tolerance and even higher than the actual risk tolerance level. Thus, meaning that the respondents made disadvantageous decisions in the Iowa gambling task much more than their financial risk tolerance score.

2.2.5 Financial Risk Tolerance and Balloon Analogue Risk Task (BART)

Mishra and Lalumière (2011) studied the relationship of personality, domain specific risk taking and behavioral measure of risk taking i.e. balloon Analogue risk task (BART). The results showed that personality traits were related to self-reported measure of risk but not related with the behavioral measure of risk.

2.2.6 Financial risk tolerance and Personality Traits

Financial risk tolerance and personality traits have been found to be related. Lauriola and Levin (2001) found that neuroticism and openness to experience are related to risk taking. The individuals who scored high on emotional stability and openness to experience were more inclined to risk taking as compared to the ones who were high in neuroticism and low in openness to experience. The domain specific risk taking comprising of six domains identifying risk taking behaviours in recreation, health, career, finance, safety and social aspects was used by Nicholson et al. (2005) to assess the risk taking propensity in 2041

individuals. The risk taking propensity was found to be high in individuals having extraversion and openness to experience traits and low in individuals who have neuroticism, agreeableness and conscientiousness traits. Pan and Statman (2010) found that risk tolerance does vary among different personality type individuals. Extraversion and openness to experience are related to high risk tolerance, while conscientiousness has a negative relationship with risk tolerance and more conscientiousness is found to be related to low risk tolerance. Agreeableness was found to be not related to risk tolerance.

The study by Wong and Carducci (2013) found that personality traits of extraversion and openness to experience are positively related to financial risk tolerance and agreeableness and conscientiousness are negatively related. They divided each personality dimension into high and low subgroups. The differences in financial risk tolerance were found in males and females in all subgroups. Lin and Lu (2015) explored the psychological and demographic factors of bettors concluded that bettors with extraversion, openness, and agreeableness had higher risk tolerance.

2.2.7 Predictors of Financial Risk Tolerance

Grable (2000) used regression to identify a model which can predict financial risk tolerance and the results showed that education, income, financial knowledge and occupation explain 22% variation in financial risk tolerance score. The research by Lauriola and Levin, (2001) used sequential regression to identify the predictors of risk taking behavior. Neuroticism and openness to experience were found to predict risk taking to achieve gain and when combined with gender and age increased the predicting power of the model R from 0.36 to 0.43 and the R^2 value increased from 0.13 to 0.19. The model for risk taking to avoid loss was not significant when the personality trait variables were entered but was significant for gender and age. Pan and Statman (2010) reported the results of the ordinary least squares regression model which showed that extraversion positively predicts risk tolerance and

conscientiousness, age group and female gender negatively predict risk tolerance. The adjusted R^2 for the OLS regression model was 0.04. The results of Anbar and Eker (2010) for the logistic regression analysis showed that the financial risk tolerance in students is predicted by gender, department and working in a job. The research by Sweet (2013) identified that the demographic variables that determine the financial risk tolerance score group best of an individual are gender and income. In the research conducted by Guillemette and Nanigian (2014) it was found that loss aversion and sentiment predict monthly risk tolerance score calculated from 2003 to 2010 and the variation explained by theses variables was 41.07%. Habit formation did not increase the predictive power of the model.

Table 2.1: Important Literature related to Financial Risk Tolerance

No.	Study	Aim of the Study and instruments	Sample Size	Main Findings
1	Grable and Lytton (1999)	assessment and development of a financial risk tolerance instrument	1075 faculty and university students, USA	13 item instrument was developed and further used by researchers and financial service providers was recommended in order to validate the instrument
2	Grable (2000)	to identify the determinants of financial risk tolerance in everyday money matters, self-reported financial knowledge, personality type was also considered along with other demographic variables	1075 faculty and university students, USA	Individuals who were male, older, married, employed, high income earners, highly educated, had more financial knowledge had high risk tolerance
3	Finke and Huston (2003)	to investigate the effect of financial risk tolerance on accumulated assets and net worth	4,305 houses data 1998 Survey of Consumer Finances (SCF)	greater financial risk tolerance was found to significantly predict higher net worth and more accumulated assets
4	Chaulk et al. (2003)	the influence of family structures on financial risk tolerance levels of individuals	Study 1 (data from university housing respondents, n = 76) and Study 2 (the 1998 Survey of Consumer Finances, n = 4,305)	The model used for studying financial risk tolerance in family context was found to be partially supported by the results
5	Hallahan et al. (2004)	relationship of demographic variables and financial risk tolerance scale	3,124 Australian respondents	gender, age income and wealth were found to be significantly related to FRT, education, dependents and marital status were found not to be related to FRT while income showed a concave relationship across age groups
6	Grable et al. (2004)	to study the relationship of socioeconomic, and psychosocial factors with financial risk tolerance, 10 true false financial knowledge items	Random sample consisting of faculty and staff from two universities, N=406	Financial risk tolerance was found to be significantly related to education, marital status, net worth, household income, financial knowledge, and self-esteem

7	Chang et al. (2004)	the aim of the study was to evaluate the relationship of age and financial risk tolerance as well as the effect of other factors on objective and subjective risk tolerance and on each other	data of 4,442 households was gathered from 2001 Survey of Consumer Finances	age was found related to objective but not subjective risk tolerance, both subjective and objective risk tolerance were found to be determined by education, ethnicity and employment
8	Yao et al. (2005)	the effect of ethnicity and ethnicity on financial risk tolerance	combination of the 1983, 1989, 1992, 1995, 1998, and 2001 Survey of Consumer Finances (SCF) datasets were used	the Blacks and Hispanics were found to be willing to take some financial risk but when compared to Whites they would take substantial financial risk
9	Anbar and Eker (2010)	relationship of demographic variables and financial risk tolerance scale	1,097 Turkish university students	gender and working in a job were found to be significant predictors of financial risk tolerance
10	Gilliam et al. (2010)	Comparison of two scales of financial risk tolerance and their association with asset allocation	328 students and faculty from colleges and universities	13 item scale developed by Grable and Lytton (1999) was found to have more explanatory power
11	Lucarelli and Brighetti (2011)	to explore the emotional side of risk tanking behaviour the study used the Iowa gambling task as an unbiased measure of risk and the biased measure of risk was the 13-item scale financial risk tolerance scale	440 individuals from Italy participated in the experimental study	the study identified that along with the rational and emotional sides there is also a third factor present while decision making which was identified to be the wandering mind. But this sleeping factor was found to be absent in traders and asset manager's decision process
12	Ryack (2011)	investigation of the impact of financial education and family relationships on financial risk tolerance	378 students, 118 fathers and 177 mothers participated from a public university in USA	husbands were found to be more risk tolerant than wives and a strong correlation of the spouse's risk tolerance was found to be present
13	Van de Venter et al. (2012)	to investigate the yearly change in financial risk tolerance over 5 years' period and to evaluate the causes of this change	3234 Australians completed the online FinaMetrica Risk profile survey	Financial risk tolerance was found not to substantially change over the 5 years' period and thus can be concluded to be a stable personality trait

14	Sulaiman (2012)	relationship of demographic variables and financial risk tolerance of individual investors	300 employees from a university in India	marital status, income and education were found to be significantly related to financial risk tolerance
15	Gibson et al. (2013)	to explore the relationship of additional factors such as investment knowledge and stock market expectations on financial risk tolerance	2000 individuals	gender, income, investment knowledge, positive stock market expectations were found to be significantly related to financial risk tolerance
16	Sweet (2013)	demographic variables relationship and determinants of financial risk tolerance	189 faculty, staff and students from two education institutes	gender and income were found to be significant predictors of financial risk tolerance
18	Lemaster and Strough (2014)	to investigate which psychological aspects of gender that cause the females to be less risk tolerant than males	627 undergraduate students from a university in USA	stereotyped masculine traits were found to be related to more financial risk tolerance in both genders while feminine traits were found to be related to less risk tolerance
19	Kannadhasan (2015)	to identify the demographic variables that effect the financial risk tolerance and financial risk taking behaviour in retail investors	778 retail investors of India with different investment experience levels	gender, age, education and occupation were found to significantly predict the level of financial risk tolerance of an investor while the determinants of the financial risk taking behaviour included gender, age, occupation and income
20	Bannier and Neubert (2016)	to understand the financial risk taking behaviour of men and women in standard and sophisticated investments by considering the influence of perceived and actual financial literacy	data from 2047 individuals among the 2009 Save Panel of German households	both perceived and actual financial literacy were found to be related to standard financial investments for men while for women only actual financial literacy was found to be related. Both men and women were found to have perceived financial literacy related for sophisticated financial investments

2.3 Financial Literacy

2.3.1 What is Financial Literacy?

'Individuals are considered financially literate if they are competent and can demonstrate they have used knowledge they have learned. Financial literacy cannot be measured directly so proxies must be used. ***Literacy is obtained through practical experience*** and active integration of knowledge. As people become more literate they become increasingly more financially sophisticated and it is conjectured that this may also mean that an individual may be more competent' (Moore et al., 2003, p. 29).

Financial literacy defined as a concept 'measuring how well an individual can understand and use personal finance-related information' (Huston, 2010, p. 308).

'Financial literacy is a measure of the degree to which one understands key financial concepts and possesses the ability and confidence to manage personal finances through appropriate, short-term decision-making and sound, long-range financial planning, while mindful of life events and changing economic conditions' (Remund, 2010, p. 284).

Financial literacy has been proved by research to be very important as it is related to stock market participation (van Rooij et al., 2011), retirement planning (Lusardi and Mitchell, 2007; Lusardi and Mitchelli, 2007; Delavande et al., 2008; Agnew et al., 2012; Van Rooij et al., 2012) emergency saving (Babiarz and Robb, 2013) and financial behaviour (Asaad, 2015).

The research on differences in individuals based on their perceived financial knowledge (self-reported) and actual financial literacy is being considered to be important and has found to influence financial behavior. Some important studies include (e.g. Goldsmith and Goldsmith, 1997, Allgood and Walstad, 2012; LaBorde et al., 2013; Tang and Baker, 2016; Bannier and Neubert, 2016). Financial literacy and financial education relationship has also been explored by researchers (e.g. Lusardi and Mitchelli, 2007; Walstad et al., 2010; Ryack,

2011; Hastings et al., 2012; Fernandes et al., 2014; Collins and Holden, 2014; Wagner, 2015).

2.3.2 Demographics and Financial Literacy

van Rooij et al. (2011) reported that the individuals aged 41-60 had highest level of advanced financial literacy and the age group 61 or over had slightly lower level of advanced financial literacy than the younger individuals. The basic financial literacy increased with the level of education. There was a significant strong relationship of advanced financial literacy and education 48% of the respondents with primary education were at the lower index of advanced financial literacy 43% of the respondents with university degree were on the higher quartile of advanced financial literacy for the basic literacy index 70% of these respondents were on the higher index. The gender gap is there for both basic and advanced financial literacy the females 34.5% of the females were in the lower quartile while only 12% are in the higher advanced financial literacy quartile.

2.3.3 Perception of financial Knowledge and Actual Financial Literacy

Goldsmith and Goldsmith (1997) concluded that male students not only score high on the actual financial investment knowledge and also perceived they know more about it while females had less self-perceived investment knowledge. Allgood and Walstad (2012) explored the significance of perceived financial knowledge and actual financial knowledge for credit card behavior. The findings showed that the predictive power of perceived knowledge is stronger for good practices in credit card management than actual financial knowledge.

The research by LaBorde et al. (2013) studied the college undergraduate students perception of financial knowledge, actual financial knowledge and their relationship with financial behavior. The actual financial knowledge was measured using 30 questions, perceived knowledge by 16 questions. The male respondents perceived financial

knowledge level was higher than females, younger individuals thought to know more but actually had less actual knowledge and older adults knew more but did not perceive to be knowledgeable.

Disney and Gathergood (2013) conducted a research in order to study the relationship between financial literacy and consumer credit portfolios as well as the level to which the individuals are self-aware of their level of understanding of financial concepts. The study used 2010 dataset that surveyed a representative sample of approximately 3,000 UK households drawn from YouGov's panel of around 350,000 interviewees. It was found from the household heads self-evaluation of their own ability to interpret financial information and concepts that they are self-aware of their poor financial literacy. It was also found that the individuals who had poor financial literacy also don't read financial pages to acquire information relating to consumer finance.

Self-esteem also influences financial behavior and thus financial knowledge is not the only significant variable that effects financial behavior. In a study by Tang and Baker (2016) incorporating the psychological variable self-esteem it was proposed that indirectly through subjective financial knowledge as well as directly effects financial behavior. Objective financial knowledge was measured using five basic financial literacy questions and the sum of correct answers were the measure of literacy while subjective financial knowledge was based on a self-evaluated 1-7 item scale question. There were differences found in both objective and subjective financial literacy and a significant association of subjective financial knowledge and self-esteem was found with financial behavior.

Bannier and Neubert (2016) focused on the gender differences in 2047 individuals in standard and sophisticated investments based on their perceived financial literacy and actual financial literacy. The perceived financial literacy was based on a self-reported 7

item question, while 9 questions were used to calculate the actual financial literacy and financial risk tolerance was also self-reported by the respondents on a ten-item scale. Women are effected by actual literacy when their decision to invest in standard investments is considered while for men both the actual and perceived financial literacy are important and related. The decision to invest in sophisticated investments was found to be more associated with perceived financial literacy and this effect was stronger for women.

2.3.4 Financial literacy and financial education

The research by Lusardi and Mitchelli (2007) concluded that in order to change financial behaviour such as retirement saving financial education cannot in one session improve financial illiteracy situation for all groups of society but more customised more personalised sessions for subgroups would be helpful. It was also found that females, low income, low education and minorities are the ones who are financially illiterate.

Walstad et al. (2010) conducted research on high school students found that financial education does help to improve financial knowledge but the researchers do mention that these findings are for young and should not be considered to be applicable universally to the older individuals as well. Hastings et al. (2012) reviewed the existing literature on the relationship of financial education and financial knowledge. The findings suggest that most of the respondents don't perform well on financial literacy questionnaires and there is a need to determine that which type of financial education is effective not only in improving financial literacy as well as economical.

Wagner (2015) found that the influence of financial education is more evident in long term as compared to short term financial behavioural. Financial literacy score was found to have small effect on the long term financial behaviour.

2.3.4.1 Financial Literacy and Retirement Planning

A study focusing on retirement planning and its relationship with financial literacy was carried out by Lusardi and Mitchell (2008). The average age of the respondents was 66 mostly being 50 years or older and they were 60% females out of the total 1264 respondents. The findings of the research are that most of the women were financially illiterate and were unable to answer simple interest and compounding questions correctly. Only less than even 17% of the women were involved in planning their retirement and for this planning they were likely to rely on either financial experts' advice or family and friends. The main conclusion of the research is that financial literacy and successful retirement planning are related and women who had high financial literacy are likely to plan and be successful in planning their retirement.

Being knowledgeable about basic financial concepts helps individuals plan their retirement, encourage to invest in the stock market and helps improve their borrowing behaviour. The importance of financial literacy has increased as individuals due to programs such as defined contribution (DC) have been made in charge of their own financial security after retirement. Being financially literate is not only about individual financial wellbeing but with the passing years it has greater implications for the society on the whole. Some countries are trying to involve the citizens in voting for economic reforms but how can they make better decisions for the society if they don't have the basic knowledge of financial concepts which is essential for such important decisions which effects the future of the country (Lusardi, 2015).

2.3.5 Financial Literacy around the world

Financial literacy research has been done in different countries for example United States (Moore et al., 2003; Rosacker et al., 2009; Asaad, 2015), United Kingdom (Gathergood and Weber, 2014; Disney and Gathergood, 2013), Australia (Beal and Delpachitra, 2003; Worthington, 2013), Italy (Fornero and Monticone, 2011), New Zealand (Cameron et al.,

2014), Russia (Klapper et al., 2013), India (Agarwalla et al., 2015) and also comparing two countries for example Korea and United States (Jang et al., 2014), four countries i.e. Canada, Italy, United States and United Kingdom (Nicolini et al., 2013).

A research focusing on review of existing studies on financial literacy in different countries including United States, United Kingdom and Australia was conducted by Marcolin and Abraham (2006). The findings of the study suggested that for future research there are a lot of possible and important areas related to financial literacy which must be considered. Financial experience is related to financial literacy and thus the characteristics of financial experience which contribute to improvement in financial literacy should be further investigated. Financial behaviour, financial success and financial sustainability are the concepts which can be linked to financial literacy but this has not been done till now.

A research was conducted by Lusardi and Mitchell (2011) compared financial literacy across eight countries. The same questions were used to measure financial literacy in all countries. The results show that firstly even in developed countries financial illiteracy is widespread, secondly there are differences in financial literacy across countries, thirdly people are knowledgeable about inflation if their country has experienced it the recent years, fourthly risk diversification knowledge is related to pension privatization in the country. Among the demographic variables age, gender, education, ethnicity and religion were found to be significantly related to financial literacy. Retirement planning was found to be related to financial literacy worldwide.

An investigative study to compare financial literacy across four countries including United states, United Kingdom, Canada and Italy was conducted by Nicolini et al. (2013). The data collected by a telephone survey 2009 FINRA was used for US, the data for UK came from the 2006 FSA survey, the 2009 Canadian Financial Capability Survey was used to get data for Canada and the Italian Survey on Household Income and Wealth was the source for

Italy. The financial literacy questions were same or similar in all surveys used and were related to investment, credit, inflation and money management. Financial literacy level varied across the four countries and the influence of sociodemographic variables was found to be inconsistent. Financial behaviour variables were found to be critical as they increased the explanatory power of the logistic regression model when added. The UK score of financial literacy was found to be highest as compared to the other countries but it might be due to the different economic situations in 2006 and 2009. The researchers emphasized that lack of a standardized financial literacy questionnaire being used worldwide and the economic and financial differences make it challenging to conduct such studies.

2.3.6 Financial literacy in Students

Chen and Volpe (2002) considering the importance of financial knowledge for properly managing individual finances conducted a study on financial literacy among college students. The results suggested that men are more knowledgeable in personal finance as compared to the women. Personal finance is less interesting to females and they rank English and other word-oriented subjects such as humanity being important while the men consider mathematics and numerical subjects as more important.

Beal and Delpachitra (2003) studied financial literacy in Australian Students The data comprised of 789 questionnaires which were completed by the students from University of Southern Queensland (USQ). The results showed that high income, higher level of work experience contribute to higher levels of financial literacy. Risk preference is negatively related to financial knowledge. Gender was also found to have significant relationship with financial literacy. Students in first year of business studies at the university because of interest and attentive behaviour towards financial concepts had better financial literacy. It was concluded that to improve the level of financial knowledge, financial education

programs at primary and secondary level should be in place to ensure better decision making for the benefit of individuals and the society.

94 students from University of Southern Queensland (USQ) participated in a research by Noon and Fogarty (2007) which focused on the relationship between personality, cognitive ability and financial literacy. The instruments included 30 item financial literacy scale, 40 item crystallised intelligence scale, 20 item abstraction scale, 17 item numeracy scale and 120 item IPIP NEO personality scale. Because of the homogenous sample the only demographic variable found to have significant relationship was years of work. All cognitive measures were significantly related to financial literacy while numeracy was the most important predictor of all. Neuroticism and agreeableness were the most significant personality traits when controlled for both demographics and cognitive ability variables.

A research on financial literacy of school students of New Zealand was conducted by Cameron et al. (2014) using data from 5 schools. All students were around 15 years old studying in mathematics class. Financial literacy was measured using a 10-item test comprising of multiple choice questions. The test was divided into three categories knowledge, comprehension and application of cognitive ability. Along with demographics the financial risk tolerance 20 item scale was to be completed by the students. The results showed that the students with lower financial risk tolerance are more likely to apply financial literacy when making decisions as compared to students with high risk tolerance. The overall financial literacy of the students was found to be low and the factors that were found to be associated to low financial literacy include social deprivation, less English ability and less mathematical ability.

A comparative study was carried out by (Jang et al., 2014) to compare the financial literacy of Korean and US high school students. Financial fitness for life High school (FFFL-HS) test was used to collect data from 40 schools in Korea. The Korean students showed higher

level of financial literacy but this may this may be due to differences in ethical and cultural values and the social experiences might have affected their financial knowledge. The researcher identifies that there may be translational bias due to translating the research tool but also emphasizes that such comparisons between countries are essential as they can help to identify strengths and weaknesses of financial education. In order to facilitate such research there is a need to develop a survey which is not based on country specific education curriculum.

Lusardi (2015) recommended that the government should ensure better understanding of financial concepts by including financial literacy as a part of the curriculum at school level so it is ensured that the individuals are well equipped with financial knowledge required to make future financial decisions. To improve the financial knowledge of the older individuals the employers should take some initiatives to provide work place financial education. Lastly the policy makers and financial industry use of financial jargons which makes the communication ineffective for the less literate so effort should be made to make it more understandable.

In order to explore the influence of childhood variables on financial literacy Grohmann et al. (2015) conducted face to face street interviews from 530 respondents in Bangkok, Thailand. The variables that were measured in this study include four item financial literacy scale, childhood variables including family and school channel variables, risk aversion was measured by one lottery based question. Childhood variables were found to related to high financial literacy and among the five variables the financial socialization by parents was found to be the most important. Financial literacy was found to be related to the number of assets. High Financial literacy was found to be associated with better financial decision making. Childhood variables related to schooling were found to also have a positive effect on financial decision making.

Research by Goldsmith and Goldsmith (2006) focused on the effect of financial investment education on the gender differences in financial knowledge. Gender differences in financial knowledge are very much important as its very interesting for not only academic researchers but to also investment firms, financial planners and governments that how women respond to financial information and how they can improve their personal financial decisions. It was suggested by the researchers that consumer education might help to improve their deficiency both in subjective and real financial knowledge.

Mandell and Klein (2007) studied the relationship of motivation and financial literacy. They hypothesized that due to lack of motivation young adults even after attending a personal finance score have low scores in financial literacy. The results show that the financial literacy being successful is related to the perception of the student about future goals such as college degree, a professional job and high salary. The main responsibility of improving the financial literacy is on the instructors who teach personal finance as they need to repeatedly assure the students that they are responsible for their future happiness which is linked to their own actions.

Murphy (2005) found that ethnicity and parental educational level were important predictors of financial literacy but age and major did not have significant predicting power in the regression model. Mandell and Klein (2007) used stepwise regression to identify that does motivational variables predict financial literacy score and found that they do. The non-motivational control variables explained 15% variability in financial literacy scores while adding the motivational variables increased the predictive power of the model by 28%.

Lusardi et al. (2010) found using a multivariate analysis of sociodemographic, family and peer characteristics that the determinants or predictors of financial literacy include gender, cognitive ability, education, parent's education. But the peer characteristics did not predict financial literacy.

2.3.7 Demographics, Financial Knowledge and Financial Literacy

Financial knowledge and financial literacy have been used interchangeably in literature by some researchers (e.g. Hilgert et al., 2003). However it has been identified by studies (Agnew and Szykman, 2005; Hung et al., 2009) that financial knowledge (self-reported) and financial literacy (measured) are found to be correlated but this relationship is moderate and not strong. Thus, one being the confidence of a person in the level of knowledge one has and the other being the measured and actual level of knowledge should be considered as being different and not as the same concept.

Research by Goldsmith and Goldsmith (1997) has shown that male students scored high on the actual financial investment knowledge and also claimed to know about it while females scored less on the same according to their self-perceived investment knowledge. Goldsmith and Goldsmith (2006) found that compared to women men know better about financial investing and are also more confident about their knowledge.

Chen and Volpe (2002) research showed that men are more financially knowledgeable as compared to women. Beal and Delpachitra (2003) research on Australian students showed that high income, higher level of work experience contributes to higher levels of financial literacy and gender has a significant relationship with financial literacy.

A research by (Fonseca et al., 2012) focused on investigating the reasons behind the gender gap that exists in financial literacy. The data was collected from the RAND ALP which showed that financial literacy was significantly different among men and women and women performed 0.7 standard deviations lower than men on the financial literacy index. Men specialized in financial decision making which increased their financial knowledge while women focused on the household functions. The study also found that financial decision making is effected by the level of education among the spouses.

A comparative study by (Jang et al., 2014) between Korean and US high school students financial literacy showed that the Korean students had higher level of financial literacy.

Lusardi (2015) conducted a research using the data from the 2009 NFCS on how well the US population know about the basic and advance financial literacy concepts. The findings of the research showed that education, ethnicity, age and gender do significantly affect financial literacy. The individuals with no college degree representing lower level of education, belonging too African American or Hispanic racial group, younger age groups and females had low financial literacy.

2.3.8 Investment Experience and Financial Literacy

Marcolin and Abraham (2006) conducted a review of research focusing on financial literacy in different countries including United States, United Kingdom and Australia. The main finding was that financial experience is related to financial literacy and thus the characteristics of financial experience which contribute to improvement in financial literacy should be further investigated. According to Lusardi (2008) Financial literacy can be affected by practically investing and saving which is termed by the researcher as 'learning by doing'. Therefore, we explore the relationship between investment experience and financial literacy.

Financial literacy not only effects financial behaviour but is also effected by financial behaviour in other words 'financial literacy is not an exogenous characteristic; in fact, literacy can itself be affected by financial behaviour (for example, if individuals learn via experience)'. (van Rooij et al., 2011, p. 462)

2.4 Risky Decision Making Experimental Tasks

2.4.1 Iowa Gambling Task

The Iowa gambling task (IGT) has been able to provide evidence for the somatic marker hypothesis. The somatic maker hypothesis given by Damasio (1994) suggests that experience of emotion is related to the decision-making process. The 'gut feelings' or 'hunches' are the somatic markers associated with emotion which might remain at the

unconscious level but guide decision making. These somatic markers play their role in hot decision making by assisting the cold decision making and thus they unconsciously bias the decision making process (Buelow and Suhr, 2009). The somatic marker system is activated in the VMPFC part of the brain so if it is damaged decision making will be impaired as argued by Damasio. As the patients with such impairment would not able to utilise the emotion experience and would have to rely only on cost-benefit analysis which is not possible in an uncertain situation. Thus, the decisions would be characterised by either extreme delay or selection of the options which would not be selected by a healthy person whose decision making would also be guided by the somatic markers. The main idea of the task is to forgo the short term benefit for long term profit (Dunn et al., 2006).

Financial behavior can be influenced by the emotional state and feelings of the individual as well. The experimental task designed by Bechara et al. (1994) showed that the individuals who could experience emotions played differently from the individuals who could not experience emotions while making decisions. It has been found that healthy patients such as risk seekers also demonstrate inability to make use of emotions and thus perform similar to the patients with ventromedial prefrontal cortex lesions. The participants who could not experience emotions followed a high risk strategy as opposed to the participants who could experience emotions followed a risk averse strategy (Lucey and Dowling, 2005).

2.4.1.1 Gender, Age, Personality and Iowa Gambling Task Performance

A research was conducted by Bolla et al. (2004) to understand the sex related decision making differences in performance on the Iowa gambling task. 20 participants between 21-45 years of age with IQ greater than 80, having English as first language, no history of drugs and addiction and consumed less than 10 alcoholic drinks per week. They were admitted for 3-day position emission tomography (PET) session at General Clinical

Research Centre (GCRC). The tasks included three cognitive conditions rest, active task and the control task. Men performed better on the Iowa gambling task than women. The men activated larger region of the lateral OFC and the right hand DLPFC than the left while women activated smaller region of the left OFC and left DLPFC as compared to men. The men performed better in the trial 2 as compared to trial 1 showing the learning effect while women showed bad performance in trial 1 and didn't get better in the trial 2. Thus, conclusion was made that women use different brain mechanisms while solving the same problem as men.

In a study conducted by Hooper et al. (2004) 145 healthy adolescents of age ranging from 9-17 participated in Iowa gambling task, working memory digit span task and go/no-go inhibition tasks. The aim of the research was to see the implications of development of the VmPFC on the performance in the IGT. The performance significantly differed among different age groups 14-17 years old group made the most advantageous decisions and could manipulate more pieces of information in the working memory. Gender differences were also found as girls had high scores on the forward digit span and higher hit rate on the inhibition task as well. The IGT performance was found not to be related to the behavioural inhibition task.

The effect of age difference on IGT performance was explored by Cauffman et al. (2010a) using a sample of 935 individuals between of 10 to 30 years of age. The demographic variables, The Wechsler Abbreviated Scale of Intelligence (WASI) and the modified version of the Iowa gambling task were used as research tools. The individuals were recruited based on a sure payment of $35 and according to their performance could win $50 maximum actually 14-30 age participants received $50 and the 10-13 age participants received $35 as prize money. Male participants had greater tendency as compared to females to play on the advantageous deck. The study showed that as age progresses from

preadolescence, adolescence to older ages the tendency to play from the disadvantageous deck decreases linearly.

In a research by Suhr and Tsanadis (2007) to assess the relationship of personality, Behavioural inhibition scale (BIS) which reflects potential punishment situations and the behavioural activation scale (BAS) reflecting the response of people to reward situations were used along with PANAS (Positive Affect Negative Affect Schedule) to performance of the Iowa gambling task (IGT) 87 non-clinical participants took part. The findings show that personality especially fun seeking and state mood do have an influence on the IGT performance. Based on this finding the researchers suggest that multiple measures of the fun seeking dimension of personality with multiple versions of the IGT should be used to understand that how personality influences decision making.

Brand and Altstötter-Gleich (2008) investigated the relationship between several personality traits and decision making under ambiguity using Iowa Gambling Task (IGT) and decision making under risk using Game of Dice task (GDT). 58 healthy volunteers participated in the study in which personality was measured using the NEO Personality Inventory Revised (NEO-PI-R) and German short version of the BIS/BAS questionnaires. In order to ensure that the participants had normal cognitive functioning The Word-Color-Interference Task and Trail-Making-Test A and B were used. Personality traits were not found to be significantly related to the laboratory tasks. But the conclusion was made that there is fundamental difference among decision under risk and decision making under ambiguity.

Toplak et al. (2010) reviewed studies using the IGT performance for understanding decision making executive functions such as inhibition, set shifting, working memory and intelligence. The stroop effect, Go/No Go Task and stop task are used to measure executive inhibition and were examined in relation to IGT. Wisconsin Card Sorting Test (WCST) and

Trailmaking Test Part B are the measures of shift mental sets. Digit Span Subset (Block Span and Spatial Span include the visual-spatial versions), Self-Ordered Pointing Task were the index measures of Working memory. Combining the scores of both verbal and non-verbal scores produces a full-scale intelligence score. Several indicators were used by the studies reviewed but all studies considered measures based on the Cattell/Horn/Carroll (CHC) theory of intelligence including the Fluid intelligence (Gf) and Crystallized intelligence (Gc) indexes. IGT composite score was calculated by using the index (C+D) - (A+B) in most of the studies. 11 studies reviewed for association of inhibition and IGT produced 21 possible correlations out of which only 5 were significant indicating dissociation between them. 18 studies reviewed producing 38 correlations suggested that IGT and set-shifting were also dissociated. 25 correlations from 15 studies and 31 correlations from 24 studies on working memory and intelligence respectively suggested that IGT is not associated with both working memory and intelligence. Therefore, the cognitive abilities are not related to the IGT performance.

In another study by Bevelhymer-Rangel (2014) 109 undergraduate students of the Ohio State University Newark participated in tasks including Positive Affect Negative Affect Schedule (PANAS), Iowa gambling task (IGT), Columbia Card Task (CCT), Game of Dice Task (GDT), Word Memory Task (WMT). The decision-making tasks were not strongly correlated with one another. But correlations among the GDT, CCT and IGT were found along with riskier decisions of the GDT were related to the riskier decisions of CCT. Thus, conclusion was made that all these task attempt to measure the same construct of decision making.

2.4.1.2 Iowa Gambling Task and Impulsivity

Impulsivity and Iowa gambling task performance have been compared by several researchers in healthy participants (Glicksohn et al., 2007; Franken et al., 2008). 61

undergraduate students participated in a research conducted by Glicksohn et al., (2007) which combined the Iowa gambling task and two questionnaires including the 54 item impulsiveness questionnaire and 30 item Barratt Impulsiveness scale.46% of the participants demonstrated impaired performance on the task while 54% performed well on the gambling task. The main suggestion for the future research was given that first look at individual data, pool and then contrast groups.

Franken et al. (2008) conducted a study to examine the relationship between impulsivity and deficit in decision making performance. 70 undergraduate psychology students participated in Rogers Decision making Task, Iowa gambling task and probabilistic reversal- learning tasks and also responded to the 19 item Impulsiveness Scale of 17 questionnaires and the 20 item Positive and negative affect scale (PANAS). The results showed that highly impulsive respondents did not learn to make advantageous choices as compared to the less impulsive as the trait of impulsivity makes it difficult to alter behaviour in response to the changes in reward. Therefore, it was concluded that trait impulsivity is associated with decision making.

Steingroever et al., (2013) reviewed eight studies which reported healthy participant's performance on the Iowa gambling task. The researchers interpreted the performance of the healthy participants using the three key assumptions of the task. The first assumption is that healthy participants learn to choose from the good decks as compared to the bad ones, the second assumption is that the participants choose cards in a homogenous or similar manner and the third and last assumption on which the task is evaluated is that the healthy participants explore in the early trials and in the later phase they try to exploit by making maximum profitable/better choices. All these assumptions were proved invalid and the suggestion was put forward by the researchers that these main assumptions of the task

which are used to evaluate healthy performance should be scrutinized in future before being used.

2.4.2 Balloon Analogue Risk Task (BART)

The balloon analogue risk task is a behavioural risk task in which the respondent has to pump the balloon and collect money with every pump there is a risk of the balloon bursting. The higher the number of pump counts and explosions the more the person is a risk taker. The research conducted by Upton et al. (2011) aimed to examine the association between the balloon analogue risk task (BART) and the Iowa gambling task (IGT). High impulsivity and low impulsivity trait groups were correlated with the early and late stages IGT performance. An association was found between IGT and BART performance but it was recommended that early and late session IGT selections should not be combined in a single measure as the trials in the start 1-40 are pre-learning reflecting decision under ambiguity and the later trials 41-100 are post-learning and reflect decision under uncertainty. The results of this research suggested that impulsivity is a very important characteristic and therefore can help to understand disadvantageous decision making in risky choice tasks such as Iowa gambling task.

Impulsivity and Iowa gambling task performance have been compared by several researchers in healthy participants (Glicksohn et al., 2007; Franken et al., 2008; Upton et al., 2011; Xu et al. 2013).

Three tasks including the balloon analogue risk task (BART), delay discounting task (DDT) and the Iowa gambling task were used by Xu et al. (2013) for assessing risk taking and impulsive behaviour. 40 healthy Chinese graduate and undergraduate students participated in the same tasks across three sessions which were two weeks apart from each other. Moderate to high reliability was found for BART and DDT tasks. While for IGT and BART

correlations were found in the second and third task but not in the first session. No correlations were found between task performance and impulsivity scales this is because impulsivity is a trait which combines attributes such as risk taking, impulsive behaviour and sensation seeking while the tasks only consider one aspect of impulsivity such as the BART focuses on risk taking.

The study by White et al. (2008) considered gender differences in 14 individuals and found that risk behavior of males and female respondents did not change over the balloon analogue risk task. The test retest reliability was found to be high for both genders. Koscielniak et al. (2016) used the balloon analogue risk task (BART) to investigate the age-related differences in performance. The 158 females were divided in to two groups younger 81 and older 76 the findings showed that the older females were more risk averse than the younger females.

Mishra and Lalumière (2011) studied the relationship of personality, domain specific risk taking and behavioral measure of risk taking i.e. balloon Analogue risk task (BART). The results showed that personality traits were related to self-reported measure of risk but not related with the behavioral measure of risk.

The following table gives a summary of the important studies by Lighthall et al. (2009); Essex et al. (2011); Ferrey and Mishra (2014); Lauriola et al. (2014); Janssen et al. (2015) and Koscielniak et al. (2016).

Table 2.2: Summary of important literature related to Balloon Analogue Risk Task (BART)

No.	Study	Aim of the study	Sample Size	Findings
1	Lighthall et al. (2009)	gender differences in how stress affects risk taking measured by BART	48 young adults were recruited for course credit or payment in exchange.	in acute stress conditions women tend to avoid risk and men take more risks
2	Essex et al. (2011)	The study aimed to assess the usability of a new behavioural task BAIT along with BART as a measure of risk taking. the individuals completed the Balloon analogue risk task (BART), Balloon analogue insurance task (BAIT), the domain specific risk tolerance questionnaire (DOSPERT) and Psychopathic personality inventory (PPI).	131 healthy individuals participated	psychopathic personality trait were found to be related to the BART and significant association was found between BAIT and the personality and risk tolerance measure thus it captures more risk related individual differences as compared to BART
3	Ferrey and Mishra (2014)	to investigate that do compensation methods affect the performance of individuals on the risk-taking task BART. The Zuckermans sensation seeking scale and Eysencks impulsivity scale were also used	282 individuals completed the task along with questionnaires	the different compensation methods did influence the performance of the individuals on the behavioural task risk taking on the task was found to be significantly related to the sensation seeking personality trait but not with impulsivity
4	Lauriola et al.(2014)	meta-analysis 22 studies which considered the balloon analogue risk task (BART)	2120 participants total of 22 studies reviewed	personality was found to be correlated with risk taking on BART for both male and female participants as well as impulsivity was also found to be related but its effect size was small as compared to sensation seeking

5	Janssen et al. (2015)	To predict the use of alcohol, cigarettes and marijuana using behavioural measure and self-reported measures of impulsivity in Dutch adolescents	284 (195 girls) adolescents participated by an online survey over a period of two years	The substance use was found not to be predicted by the behavioural measures
6	Koscielniak et al. (2016)	the effect of age on risk taking	158 female participants from two distinct age groups, 81 university students aged (18-23) and 77 participants aged (65-80) years. Participants who performed better received prizes	the older females were found to be more risk averse and performed lower on the task as compared to the younger females

2.5 Personality Traits

A trait is defined as 'A trait is a dimension of personality used to categorize people according to the degree to which they manifest a particular characteristic' (Burger, 2007, p. 155). The idea of identifying individuals with similar 'dispositions' or individual differences which we now know as personality traits was first introduced by Greek Philosopher Aristotle. The main difference between personality types and personality traits is that personality types are separate categories in which individuals are placed while personality traits are continuous dimensions along which individuals can have different positions according to the amount of the trait possessed. There are two basic assumptions of the trait theory the first is that there is stability in the personality characteristics of individuals and the second assumption is that individuals have consistency in the way they behave in different situations. The main idea is to understand how group of individuals who score high on a personality trait behave as compared to the ones who score low on the same trait (Maltby et al., 2010).

The neuroticism trait if high in investors leads to indecision and the opposite emotional stability if high is least correlated with investment biases. High risk taking and high overall returns were found to be mostly correlated to the personality traits of Openness to experience and extraversion. Conscientious investors take less risk than the impulsive ones (Peterson, 2011a).

A research by Noon and Fogarty (2007) focused on the relationship between personality, cognitive ability and financial literacy and it showed that neuroticism and agreeableness were the most significant personality traits when controlled for both demographics and cognitive ability variables. Letkiewicz and Fox (2014) explored the relationship of net worth of young American adults with conscientiousness and financial literacy. The conclusion was drawn that financial literacy moderates the relationship of

conscientiousness and net worth for high and mean values but at low level of financial literacy there is no effect seen.

2.6 Decision Making Styles

The decision-making styles are defined as “the learned habitual response pattern exhibited by an individual when confronted with a decision situation. It is not a personality trait, but a habit-based propensity to react in a certain way in a specific decision context” (Scott and Bruce, 1995, p. 820).

Leykin and DeRubeis, (2010) conducted a research on the relationship between decision making styles and symptoms of depression in individuals. It was found that avoidance of decisions, brooding and anxiety related to decisions are related to symptoms of depression. Individuals with depressive symptoms would not most likely trust their intuition and won’t make decisions vigilantly while both depressed and non-depressed individuals may make decisions spontaneously. Curseu and Schruijer (2012) conducted a study on manager’s decision making styles which showed that intuitive decision making style is significantly correlated with spontaneous decision style while dependent and avoidant decision style were associated.

2.7 Conclusion of the Chapter

The review of the relevant literature was given in this chapter there has been focus on financial literacy around the world but it has not been studied in the United Kingdom as much as it should have been. The next chapter gives the research methodology used and the data collection procedure along with the hypotheses.

3 Chapter Three: Research Methodology and Data Collection

3.1 Introduction of the Chapter

This chapter describes how the questionnaire and experimental tasks were designed, how the data was collected the steps involved in data collection, reliability and validity of the measures and also identifies ethical considerations of the research. It also describes the measures along with their coding as well as the different statistical techniques used for testing each hypothesis.

The research data was collected using questionnaire and cognitive experimental tasks.

3.2 Questionnaire Design

The questionnaire is the most widely used research tool because it makes it easy to gather information and the responses of this tool can be easily coded (Sekaran & Bougie, 2010). The questionnaire prepared using Qualtrics software consisted of total 101 questions which included the consent form consisting of six questions, nine demographic questions, 13 items financial risk tolerance, 11 items financial literacy, 44 items personality traits, 15 items decision making styles, 3 items of investment experience. This software license was purchased by Kingston University. All questions were closed ended questions comprising of yes/no, multiple choices and Likert scale items. The closed ended questions were used because these type of questions make comparison of the results for the variables easier, are easy to process, clarify the meaning of the question to the respondent, easy to complete and also reduce the variability in recording answers as opposed to open ended questions (Bryman and Bell, 2007).

The survey was online and the link to the survey was https://kingstonpcs.eu.qualtrics.com/SE/?SID=SV_3k0K2K49ExuZlQx. The survey flow was managed by adding display logics and skip logics according to specific options each respondent chose. The final questionnaire (See Appendix A: Questionnaire) included consent form only participants who agreed to provide information by choosing option 'Yes' moved to the demographics questions as soon as any participant chose 'No' option the survey ended.

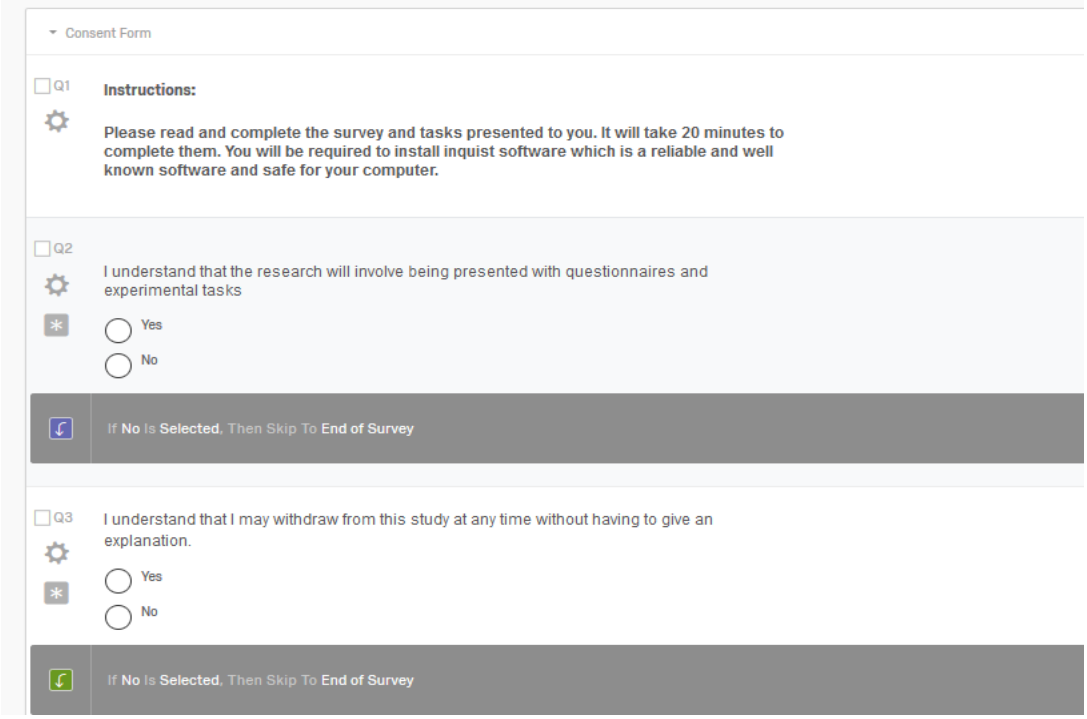

Figure 3.1: Screenshot of the Questionnaire Consent form section ("Edit Survey | Qualtrics Survey Software," n.d.)

A screening question was included to make sure the requirement of at least some level of financial knowledge was met (How will you describe your level of financial knowledge? options were None, Little, Some and A Lot the participants who responded as having no financial knowledge their responses were not included). If the respondent had no investment experience or was less than 13 years of age the data was not recorded and the survey ended there for the respondent. The link address was given in the survey options to

which the respondent was redirected as (http://research.millisecond.com/k1253047/experiment.web?Subjectid=${e://Field/ResponseID}). The ResponseID field recorded a unique id for each respondent which was then later used to identify and combine the experimental data and survey data of the same respondent recorded in the two-different software's.

The survey flow was as designed as shown in the following figure as a screenshot.

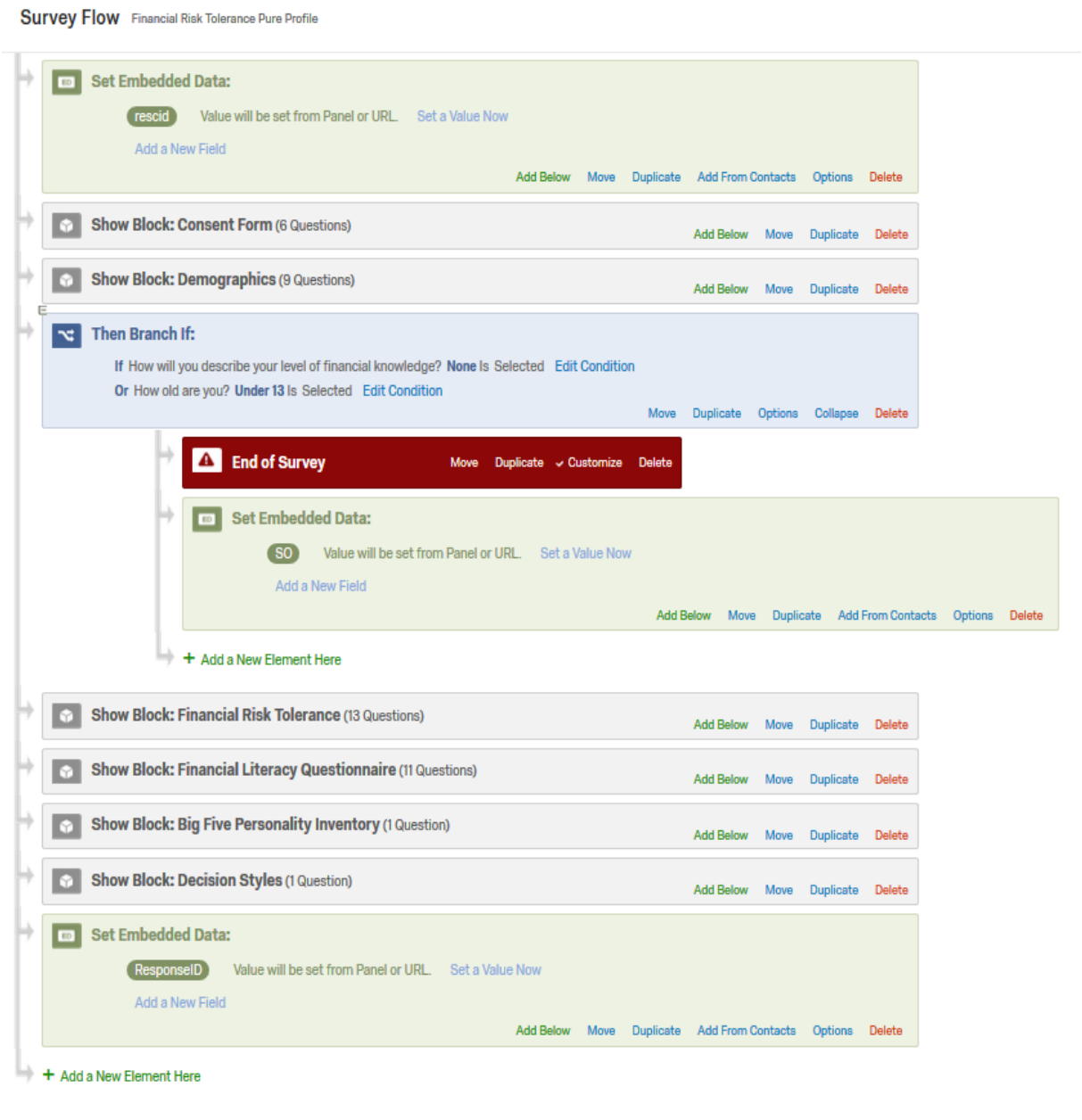

Figure 3.2: Screenshot of the Survey flow created in Qualtrics

3.3 Experimental Design

The inquisit lab web 4 software license was purchased through self-funding first for two months and then for one year by the researcher. Numerous well known cognitive and neuropsychological scripts are available for free from the millisecond test library. The experimental task scripts were combined in a web script written in inquisit lab 4 software by writing a small program ("Millisecond - Makers of Inquisit," n.d.). The iowa gambling task (IGT) was displayed to the respondents first then they completed the balloon analogue risk task (BART).

3.4 Sample Design

The sample population was United Kingdom and the respondent's demographics were specified as required to be finance students or investors understanding financial concepts. The sample size of the study included 244 online completed surveys. The respondents filled the questionnaires after which they participated in two cognitive risky decision making tasks.

3.4.1 Steps in data collection

Before the data collection a small study was conducted using Financial risk tolerance, financial literacy and personality type questionnaires which were filled by 46 Kingston University finance students in April, 2015. The aim was to identify the timing and understanding of the questionnaires by the finance students.

The data was decided to be collected by students and prospective investors directly by e-mail and in return £5 reward was offered to them. But after numerous reminders the completed surveys were only few. The main reason for the low response rate was that the questionnaire designed in Qualtrics online software led to inquisit for completing the two tasks which required them to install software on their computers. Therefore, In order to gather the data a survey company 'Pureprofile' was contacted which is widely used by

researchers for data collection (e.g. Agnew et al., 2012; Bateman et al., 2012; Robertson and Newby, 2013). The survey was prepared using software Qualtrics and the experimental tasks were presented using Inquisit software. The respondents first filled the online survey and were redirected to Inquisit link which recorded the task data to the software.

The following steps were involved in completing the surveys and tasks both:

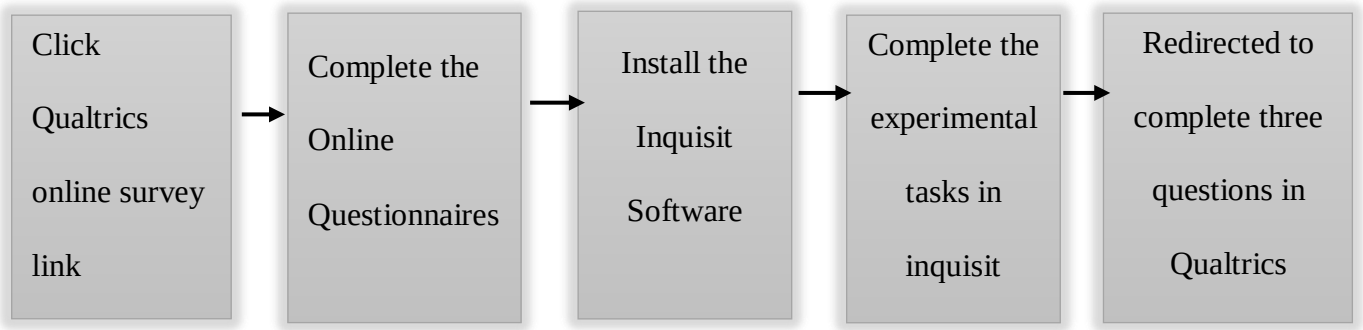

Figure 3.3: The steps completed by the respondents for the surveys and experimental tasks

The requirement given to the company was to get 200 questionnaires and tasks completed by respondents. The sample population being United Kingdom and the respondent's demographics should also be finance students or investors understanding financial concepts. The screening questions were included to make sure the requirement is met such as financial knowledge. The completed questionnaires were 644 but because the experimental tasks were not completed so only 244 total complete questionnaires for which the tasks were completed were included in analysis.

3.5 Ethical Considerations

In order to collect the data from students of Kingston University at the campus proper ethical approval was taken from the faculty. The students were then asked if they wanted to volunteer to provide their email addresses on an information sheet about which they were also given a briefing by the researcher (See Appendix B: Information Sheet for Research

Participants). Only the students who provided their email addresses were sent the survey link and then completion an email for saying thank you and an amazon voucher worth 5 pounds was sent to them shortly. The questionnaires that were used in the research permission for using them was asked for by email from the researchers and they gave permission (See Appendix C: Permission for using the Questionnaires). The inquisit lab 4 software license was purchased from the milliseconds website who provide experimental scripts free of cost for using with the software.

3.6 Measures

The research data was collected using a questionnaire and cognitive experimental tasks. The questionnaires used included Big Five Personality Model 44 item scale, Financial Risk Tolerance by Grable and Lytton (1999) 13 item scale, Financial Literacy 11 item scale, General Decision-Making Style Inventory (15 items). These questionnaires along with the two experiments i.e. Iowa gambling task (IGT) Bechara (1994) 100 trials and Balloon Analogue Risk Task (BART) 30 trials by Lejuez et al. (2002) were completed by participants.

3.6.1 Financial Risk Tolerance

Financial Risk Tolerance by Grable and Lytton (1999) is a self-report 13 item measure used for assessing the risk tolerance of the respondents in financial decisions.

3.6.2 Perceived Financial Knowledge

The self-assessed level of financial knowledge which was self-reported by the respondent is perceived financial knowledge. It was measured using the question 'How will you describe your level of financial knowledge? options were None, Little, Some and A Lot' the participants who responded as having no financial knowledge their responses were not included. The values were coded as little being 1, Some as 2 and a lot was coded as 3.

3.6.3 Actual Financial Knowledge/Literacy

The actual financial knowledge or financial literacy was measured using a 11 item scale given by (Fernandes et al., 2014b). The correct answers were added up to calculate the financial literacy score of each individual. The Cronbach's alpha for value of the 11 items of this scale was calculated to be 0.85 which is considered to be good as mentioned by George and Mallery (2003) (seen from (Gliem and Gliem, 2003)).

3.6.4 Basic Financial Literacy

The basic financial literacy concepts cover knowledge of inflation, calculation of interest rates and compounding (van Rooij et al., 2011). The basic financial literacy was measured by three items and the 8 items out of the 11 were used to measure the advanced financial literacy. The questions that measure basic financial literacy (question 1 is from (LUSARDI and MITCHELL, 2011), Q8 is from (van Rooij et al., 2011) and Q11 is from (Lusardi and Tufano, 2009) as seen from (Fernandes et al., 2014b)). The questions that measure basic financial literacy include one question about knowledge of Inflation and two questions about Numeracy/Knowledge of interest compounding.

3.6.5 Advanced Financial Literacy

The advanced financial literacy concepts include risk diversification, difference between stocks and bonds, knowledge of mutual funds (van Rooij et al., 2011). Following are the questions that measure advanced financial literacy (Q2 is from (LUSARDI and MITCHELL, 2011), Q3,Q4,Q5,Q9,Q10 are from (van Rooij et al., 2011), Q6 is from (Agnew and Szykman, 2005) and Q7 is from (Hung et al., 2009) as seen from (Fernandes et al., 2014b)). The eight questions that measure advanced financial literacy include two questions about Stocks or Bonds, one question each related to Long Period Return, High Fluctuations, Diversification of risk and three questions on Knowledge of Mutual Funds.

3.6.6 Investment Experience

There were three questions that were asked related to investment experience the first one was related to number of years of investing named as investment experience, then second was related to investment instruments and the third one was related to the investing frequency. The respondent's investment experience was evaluated by using a self-reported item (How many years have you been investing? Which was answered with options one to five years, more than five years and Never).

3.6.7 Big Five Personality Inventory (BFI)

The Cronbach's alpha reliabilities of the BFI scale ranges from 0.75 to 0.90 and the average is above 0.80 in American and Canadian samples. The test– retest reliabilities for three months range from 0.80 to 0.90, with a mean of 0.85 (John and Srivastava, 1999).

3.6.8 Decision making Styles

General Decision-Making Style Inventory comprises of five decision styles and 25 items but in the current study research three decision making styles 15 items have been used. The scales convergent validity was evaluated by Gambetti et al. (2008) using correlations with sensation seeking and locus of control scales and Loo (2000) used pattern relationships of the decision making styles and 20 value scales which supports construct validity of the instrument. Research shows that intuitive and spontaneous styles are positively correlated and rational scale is negatively correlated.

Research on the latent structure of these styles by Dewberry et al. (2013) shows that rational (vigilance), intuition and spontaneous styles are styles concerned with core decision making process and thus were considered to be used in this research only.

3.6.9 Iowa Gambling Task (IGT)

The Iowa gambling task is a task performed individually by participants which captures the uncertainty of real life decision making using an experimental measure and was described by Bechara et al. (1994) for the first time. The task consists of total 100 cards divided as four decks (A,B, C,D) and the cards are assigned monetary rewards and penalties (Toplak et al. 2010). Two decks are advantageous (C and D) as they end up in a positive final balance because of the moderate gains and moderate low losses related to them. The other two decks (A and B) are disadvantageous as even they give high gains but also result in very high losses and thus eventually lead to a negative final balance (Brand et al. 2006).

The score was calculated as (C+D) - (A+B) after each 20 trials at 20,40,60,80 and 100 trials thus were divided into 5 blocks. For comparisons, last 3 blocks consisting of 60 trials were used (as seen from (Evans et al., 2004; Newman, 2009; Gansler et al., 2011; Lin et al., 2013; Burdick et al., 2013). Numerous studies (Maia and McClelland, 2004; Bowman et al., 2005; Suhr and Tsanadis, 2007; Buelow and Suhr, 2009; Harman, 2011; Upton et al., 2011; Bull et al., 2015; Okdie et al., 2016) that were conducted by researchers to investigate the Iowa gambling task performance used students as their sampling unit. Most of the students were awarded course credit for their participation and undergraduate or university students.

The following screenshot gives an idea of how the task is presented to the respondents.

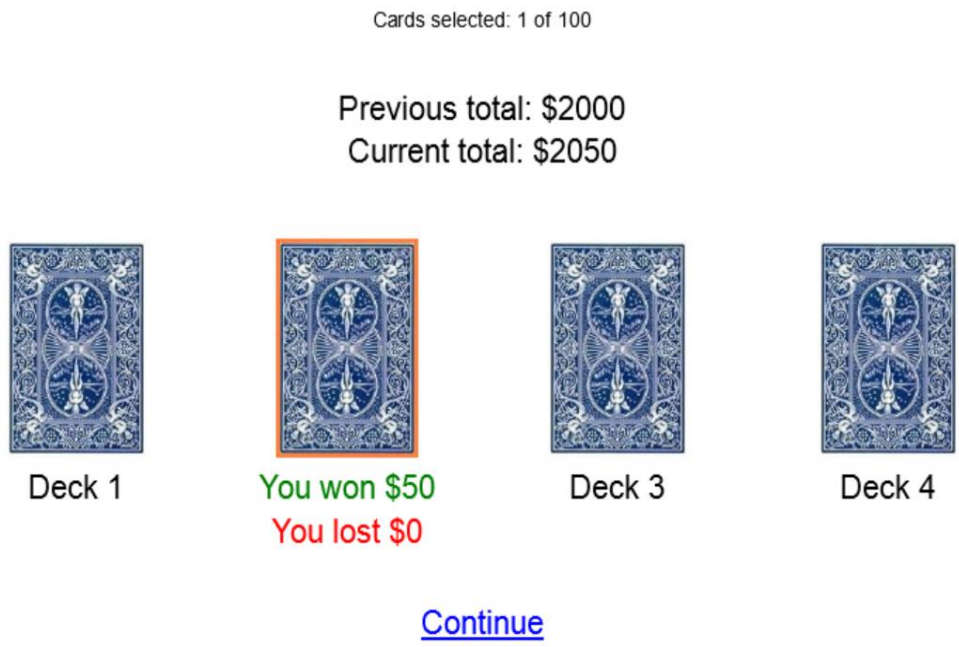

Figure 3.4: Screenshot of the Iowa Gambling Task

3.6.10 Balloon Analog Risk Task (BART)

The Balloon Analog Risk Task (BART) (Lejuez et al., 2002) is a task in which participants are asked to inflate a balloon and every time the balloon is inflated they gain money but if the balloon is inflated more it might explode and thus they lose money. The less times the balloon is inflated the participant is considered to be risk averse (Upton et al., 2011a). It has total 30 trials and the measures used for assessing impulsivity were adjusted average number of pump count and explosions (as seen from (Lejuez et al., 2002; Mishra and Lalumière, 2011).

Figure 3.5: Screenshot of the Balloon Analogue Risk Task (BART)

As reported by White et al. (2008) the task has test-retest reliability (r = +.77) and thus can be used to measure risky behaviour.

3.7 Rationale for using the experimental tasks

There are a number of risky decision-making tasks such as Columbia Card Task (CCT), Game of Dice Task (GDT), Cake Gambling Task apart from the Iowa gambling task (IGT) and the Balloon analogue risk task (BART). But the Iowa gambling task (Bechara et al., 1994) has been widely used by researchers in neuropsychology (e.g. Lawrence et al., 2009; Li et al., 2010; Bagneux et al., 2013). It combines complex decision-making components such as risk, ambiguity, uncertainty, reward, punishments and learning from experience it simulates real world decision making abilities. It has also been successful in discriminating among healthy and clinical populations risky decision making (Bechara et al., 1996; Bechara et al., 1997; Bechara, 2004). The task is also unique as it combines both decision making types i.e. decision under ambiguity and decision under risk. In the early stages the decision making is under ambiguity while in the later stages its decision making under risk (Harman, 2011).

The balloon analogue risk task is considered to be a novel experimental task used for assessing risk taking. It has been found to be associated with real world risk taking behaviours such as use of alcohol and drugs, smoking, gambling , theft, aggression, and unprotected sexual intercourse ((Aklin et al., 2005; Lejuez et al., 2002) as seen from Hunt et al. (2005)).

Both the tasks Iowa gambling task (IGT) and Balloon Analogue Risk Task (BART) were used as data collection tools mainly because results of the earlier research such as Upton et al. (2011) have suggested that impulsivity as measured by the task can help us to understand why some individuals make more disadvantageous decisions in risky choice tasks such as the Iowa gambling task.

The tasks have to be completed online by the respondents in one go and take at least 15-20 minutes which might be considered a disadvantage. Because of which some people might be reluctant to participate in an experimental study.

3.8 Reliability and Validity

The Cronbach's alpha was calculated for the questionnaire items and was considered on the basis of rule of thumb '> .9 – Excellent, > .8 – Good, > .7 – Acceptable, > .6 – Questionable, > .5 Poor, and < .5 – Unacceptable' provided by George and Mallery (2003) (as seen from (Gliem and Gliem, 2003)).

Table 3.1: Scale Reliability based on Cronbach's Alpha

Reliability Analysis: Sample Size 244			
Questionnaire	Items	Cronbach's Alpha	Reliability
Big Five Inventory			
Extraversion	8	0.88	Good
Agreeableness	9	0.68	Acceptable
Conscientiousness	9	0.87	Good

Neuroticism	8	0.84	Good
openness to experience	10	0.81	Good
Decision Styles Inventory			
Vigilance	6	0.91	Excellent
Spontaneous	4	0.88	Good
intuition	5	0.86	Good
Financial Risk Tolerance	13	0.71	Acceptable
Financial Literacy	11	0.85	Good

3.9 Coding and Statistical techniques used for Data Analysis

The first dependent variable was financial risk tolerance score calculated by summing the responses to the 13 items of the questionnaire coding was done according to the criteria given by Grable and Lytton (1999). The score variable was converted for analysis purposes into two categories of high financial risk tolerant and low financial risk tolerant individuals these two categories were based on the mean score which was 26 the respondents with higher score than 26 high risk tolerant and less than 26 were categorised as being low risk tolerant. The five categories given by Grable and Lytton (1999) were 18 or below= Low risk tolerance (i.e., conservative investor), 19 to 22= Below-average risk tolerance, 23 to 28= Average/moderate risk tolerance, 29 to 32= Above-average risk tolerance, 33 and above= High risk tolerance (i.e., aggressive investor) which were also used for analysis. The range of the score was from 15-39 and there was no missing data and the z-score values were within the range of ±0.09 - ±2.69 and thus did not exceed the threshold of ±3.29. The Q-Q plot indicated an approximate normal distribution.

The Skewness (measure of symmetry of the distribution) and kurtosis (measure of peakedness of the distribution) values were 0.282 and -0.472 respectively. The values of

skewness and kurtosis are zero for a normal distribution but this is very difficult for real world data. The values of skewness and kurtosis can be interpreted by dividing the skewness and kurtosis values by their respective standard error which gives us the z-score value. If the resulting value is greater than 1.96 then the data has skewness or kurtosis. Z-score is the score of a distribution which has zero mean and standard deviation 1 (Rumsey, 2011). The calculation for skewness and kurtosis were 1.807 and 1.518 both less than 1.96 thus the data was not skewed nor had kurtosis[3].

The second dependent variable for the study was financial literacy and was checked for missing data, outliers and normality. There was no missing data and the z-score values were within the range of ±1.35 - ±2.33 and thus did not exceed the threshold of ±3.29. The Q-Q plot indicated an approximate normal distribution.

The central limit theorem implies that as long as the sample size is large enough the shape of the distribution will be approximately normal. The sample size was 244 which is large enough. Therefore, the normality can be assumed according to central limit theorem in this case and thus the parametric tests and linear regression can be used to draw conclusions (Rumsey, 2011).

The perceived financial knowledge has three categories little (coded as 1), some (coded as 1) and a lot (coded as 3) while the financial literacy score was converted into two categories high financial literacy (coded as 1) and low financial literacy (coded as 0). Thus, the combinations for analysis perceived financial knowledge and actual financial literacy were

[3] Skewness Value= 0.282 and Standard error= 0.156 Z-score value= 1.807

Kurtosis Value= -0.472 and Standard error= 0.310 Z-score Value= -1.518

(little financial knowledge, high financial literacy), (some financial knowledge, high financial literacy), (a lot financial knowledge, high financial literacy), (little financial knowledge, low financial literacy), (some financial knowledge, low financial literacy), (a lot financial knowledge, low financial literacy). The actual financial literacy score/index was calculated by adding all the responses where correct answer was coded as 1 and incorrect answer, refuse to answer and don't know were coded as 0. The summary of the correct, incorrect, don't know and refuse to answer percentages are summarized (See Appendix D: Percentage of correct, incorrect, don't know and refuse to answer responses by the respondents).

The performance measure for IGT was the number of cards selected from the advantageous deck (C+D) minus the number of cards selected from the disadvantageous deck (A+B). This value was calculated both for 60 trials and 100 trials as well as separately for the 5 blocks (each consisting of 20 cards). The risk preference and risk aversion measures were calculated as defined by Glicksohn et al. (2007a) the risk preference is the number of choices made from the two disadvantageous decks A and B (A+B) and risk aversion the number of choices from the two advantageous decks C and D (C+D). The RA>50 is considered to be normal performance according to (Fellows and Farah, 2005) and (Glicksohn et al., 2007b).

Table 3.2: Variables their Measurement and References

Variables	**Measurement**	**References or Calculation**
Financial Literacy Score	Sum of all 11 questions score (Correct answer =1, incorrect answer=0)	
Perceived Financial Knowledge	Self-Reported answer (Little=1, Some=2, A lot =3)	
Financial Risk Tolerance Score	The Sum of the coded values of the 13-item scale	(Grable and Lytton, 1999)

Financial Risk Tolerance Categories	<26.0 = Low risk tolerance, > 26.0 = High Risk Tolerance	The mean score of the financial risk tolerance was 26 therefore the values above 26 were coded '1' as high risk tolerance and below as '0' low risk tolerance
Financial Risk Tolerance Categories	18 or below= Low risk tolerance (i.e., conservative investor) 19 to 22= Below-average risk tolerance 23 to 28= Average/moderate risk tolerance 29 to 32= Above-average risk tolerance 33 and above= High risk tolerance (i.e., aggressive investor)	(Grable and Lytton, 1999)
Iowa gambling Task Block Scores	(C+D) -(A+B) score was calculated after each 20 trials at 20,40,60,80 and 100 trials thus were divided into 5 blocks. For comparisons, last 3 blocks consisting of 60 trials were used	(Evans et al., 2004), (Newman, 2009), (Gansler et al., 2011), (Lin et al., 2013), (Burdick et al., 2013)
Risk Preference (RP) and Risk Aversion (RA)	RP= number of choices made from disadvantageous decks A and B (A+B) RA= number of choices from the advantageous decks C and D (C+D) Normal performance =RA>50	(Fellows and Farah, 2005) (Glicksohn et al., 2007)
BART	Adjusted number of pumps, Number of balloons exploded	(Lejuez et al., 2002)

The data was saved in the two software's the survey data was extracted from qualtircs and the experimental data from inquisit. Both data were then processed in excel and then analyzed using software SPSS 23 version. The statistical techniques such as Chi Square, ANOVA, Pearson Correlation, repeated measures ANOVA, mixed factor ANOVA were utilised. One Way ANOVA was used for the identifying significant differences in groups

based on categorical variables. Pearson correlation can be used where both the variables are interval or ratio and can also be applied for only categorical variables with two categories such as gender (male=1, female=2) (Field, 2013).

3.9.1 Regression Model

The model that can predict a dependent variable using several independent variables is known as the regression model. The regression model is used to express the causal relationship between the variables in the form of an equation. Mostly the variable which is the ratio level dependent variable should be explained by various ratio or interval level variables for example in this research the financial risk tolerance score and financial literacy score variables. Categorical variables can also be used as predictors but they are certain requirements for using them. If we want to include a dichotomous variable (with two categories) it should be coded as 0 or 1 for example gender so for regression modelling gender was coded as (male=1 and female=0). In order to use a variable which is polytomous (having many categories) we need to use dummy variables (Cavanaugh and Fox, 2009). In order to see that how investment experience and perceived financial knowledge predict financial risk tolerance score and financial literacy score both these categorical variables were converted into two dummy variables. Using the steps mentioned by Field (2013) the investment experience variable was converted into two dummy variables. The variable had three categories so to recode it as the rule two variables D1 and D2 were used (Number of dummy variables= Total Number of Categories - 1) (i.e. NoExperienceVs1to5yearsExperience_D1 and NoExperienceVsMorethan5yearsEXp_D2). One of the categories was to be chosen as the baseline group on the basis of the interest in comparing the not experienced category with the two experienced groups the no experience category was used as baseline group. The coding of the dummy variables was according to the following table:

Table 3.3: Coding of Dummy Variables for Investment Experience

Investment Experience	D1	D2
No Experience	0	0
1 to 5 years Investment Experience	1	0
More than 5 years Investment Experience	0	1

The following three tables summarize the hypotheses variables and the statistical techniques used for testing them for the three research questions described in the first chapter.

Table 3.4: Hypotheses and the statistical analysis technique used for testing them

	Hypotheses	Analysis
H1	Gender and financial risk tolerance Score	Independent Samples T-Test
	Age and Financial Risk Tolerance	One Way ANOVA
	Education and financial Risk Tolerance	One Way ANOVA
	Investment Experience and Financial Risk Tolerance	One Way ANOVA
	Investment Instruments and Financial Risk Tolerance	One Way ANOVA
H1b	Personality Traits and Financial Risk Tolerance	Pearson Correlation, ANOVA
H1c	Decision making Styles and Financial Risk Tolerance	Pearson Correlation
H2a	Gender and Basic financial literacy	Independent Samples T-Test
	Gender and advanced financial literacy	
	Age Categories and Basic financial literacy	One Way ANOVA
	Age Categories and advanced financial literacy	One Way ANOVA
	Education levels and Basic financial literacy	One Way ANOVA
	Education and advanced financial literacy	
	Investment Experience and Basic financial literacy	One Way ANOVA
	Investment Experience and advance financial literacy	

H2b	Gender and Perceived Financial Knowledge	Chi Square
	Gender and actual financial literacy	Pearson Correlation
	Age and Perceived Financial Knowledge	Pearson Chi Square
	Age and actual financial literacy	One Way ANOVA
	Education and Perceived Knowledge	Pearson Chi Square
	Education and Actual financial literacy	One Way ANOVA
	Investment Experience and Perceived Knowledge	Pearson Chi Square
	Investment Experience and actual financial literacy	One Way ANOVA
H3a	Personality Traits and Basic financial literacy	Pearson Correlation
	Personality Traits and Advance financial literacy	
	Decision Making Styles and Basic financial literacy	Pearson Correlation
	Decision Making Styles and Advance financial literacy	
H3b	Personality Traits and Perceived Financial Knowledge levels	One-Way ANOVA
	Personality Traits and Actual financial literacy	Pearson Correlation
	Decision Making Styles and Perceived Financial Knowledge	One Way ANOVA
	Decision Making Styles and Actual financial literacy	Pearson Correlation
H4	Demographics and Iowa gambling Task	ANOVA
	Personality Traits and Iowa gambling Task	Pearson Correlation
H5	Investment Experience and Iowa gambling task Performance	Two Way Mixed factor ANOVA, ANOVA, Mixed factor ANOVA
H6	Personality Traits and Investment Experience	One Way ANOVA
H7	Demographics and BART	One Way ANOVA
H8	Student and investor differences in Iowa gambling task performance	One Way ANOVA (card Selection differences)

Table 3.5: Hypotheses for Research question 2 and the statistical analysis techniques used for testing them

	Hypotheses	Analysis
H1	Financial Risk Tolerance and Basic financial literacy	One Way ANOVA
	Financial Risk Tolerance and Advanced financial literacy	
H2	Financial Risk Tolerance and Actual financial literacy	
H3	Financial Risk Tolerance score and Perceived Financial Knowledge	One Way ANOVA
H4	Iowa gambling task Performance and financial risk Tolerance	Mixed Factor ANOVA, ANOVA (card Selection)
H5	BART and Financial Risk Tolerance	ANOVA
H6	Iowa gambling task performance and Basic financial literacy	Pearson Correlation
	Iowa gambling task performance and Advanced financial literacy	
H7	Iowa gambling task performance and Perceived Financial Knowledge	Repeated measures ANOVA, Pearson Correlation
	Financial Knowledge and Iowa gambling Task Performance	Mixed factor ANOVA, ANOVA Card Selection
	Iowa gambling task performance and Actual financial literacy	Pearson Correlation (cards selection)
H8	Balloon Analogue Risk Task and Basic financial literacy	Pearson Correlation
	Balloon Analogue Risk Task and Advanced financial literacy	
H9	Balloon Analogue Risk Task and Perceived Financial Knowledge	
	Balloon Analogue Risk Task and Actual financial literacy	

Table 3.6: Hypotheses for Research question 3 and the statistical analysis techniques used for testing them

	Hypotheses	Analysis
H1	Predictors of financial risk tolerance	Multiple Regression

H2	Prediction of Financial Literacy Score by combination of Demographic variables	Multiple Regression

3.10 Conclusion of the Chapter

The questionnaires were designed online as well as the experimental tasks in order to collect the data. The data was collected online from 244 respondents living in United Kingdom. The data was coded and prepared for statistical analysis according to the hypotheses formulated in chapter three. The statistical analysis techniques that were applied for testing the hypotheses were also given in tabular form.

4 Chapter Four: Analysis of the Data

4.1 Introduction of the Chapter

The analysis was divided into four main parts the first part covers the descriptive statistics related to the variables. The second part consists of the findings of the first research question including the relationship of demographic variables, personality traits, decision making styles and financial risk tolerance, financial literacy (basic and advanced, perceived knowledge and actual financial literacy), risky decision-making task variables. The third part investigates the relationship of the financial risk tolerance, financial literacy (basic and advanced, perceived knowledge and actual financial literacy) and risky decision-making task variables with each other. The forth part gives the regression models for prediction of financial risk tolerance score and financial literacy score.

4.2 Descriptive Statistics and Card Selection statistics

4.2.1 Descriptive Statistics for Demographic Variables

The sample consisted of 46.3% male and 53.7% females, 5% respondents were of age 18-25, 50% were between 35 and 54 years of age bracket while 20.9% and 14.3% were in the age ranges of 55-64 and 26-34 respectively and 9% were 65 years and above. The 33.2% had a Bachelor's degree and 18.9% a Master's degree. The ethnicity of the 82.4% was described to be white British, 7.4% being Asian and 11% other. 57.8% of the respondents are employed for wages and 10.7% self-employed. 32.8% identified themselves as being professional investors and 13.1% were finance students. 41% had scores above 26 thus were categorized as high financial risk tolerant and 59% had low financial risk tolerance. The impulsivity was measured using the Balloon Analogue Task Average adjusted pump counts and categorized showing 59.4% being less impulsive and 40.6% highly impulsive (See Table 4.1: Descriptive Statistics for the Demographic Variables).

Table 4.1: Descriptive Statistics for the Demographic Variables

Variables	Categories	Frequency	Percentage
Gender	Male	113	46%
	Female	131	54%
Age			
	18-25	11	5%
	26-34	35	14%
	35-54	122	50%
	55-64	51	21%
	65 or over	22	9%
Level of education			
	Some high school, no diploma	15	6%
	High school graduate, diploma or the equivalent	24	10%
	Some college credit, no degree	20	8%
	Trade/technical/vocational training	23	9%
	Associate degree	8	3%
	Bachelor's degree	81	33%
	Master's degree	46	19%
	Professional degree	19	8%
	Doctorate degree	7	3%
Ethnicity	White British (English/Welsh/Scottish/Northern Irish/British)	201	82%
	White (Irish, European, traveller, Gypsy)	9	4%
	Black (Black British, African, Caribbean)	6	3%
	Asian (Asian British, Indian, Pakistani, Bangladeshi, Chinese, Japanese)	18	7%
	Middle Eastern/Arab	3	1%
	Mixed/Multiple heritage	7	3%
Employment Status	Employed for wages	141	58%
	Self-employed	26	11%
	Out of work and looking for work	5	2%
	Out of work but not currently looking for work	3	1%
	A homemaker	10	4%
	A student	21	9%
	Retired	33	14%
	Unable to work	5	2%
Marital status	Single, never married	52	21%
	Married without children	38	16%
	Married with children	112	46%
	Divorced	13	5%
	Separated	3	1%
	Widowed	2	1%
	Living w/ partner	24	10%

4.2.2 Descriptive Statistics for Financial Knowledge Financial Risk Tolerance and Financial Literacy

The descriptive statistics for the perceived financial knowledge showed that most of the respondents 62.7% perceived to have some financial knowledge 15% had a lot and 22% said that they had little financial knowledge. Actual financial literacy score when converted into categories revealed that more than 70% of the respondents had high financial literacy (answered at least more than 5 questions correctly) while only 28.7% were in the low financial literacy category. 40% of the respondents had high financial risk tolerance and 60% were low risk tolerant. In the financial risk tolerance score categories, the 39% of the respondents were found to have average financial risk tolerance while 26% were in the below average risk tolerant group and 19% had above average financial risk tolerance.

Table 4.2: Descriptive Statistics for Financial Knowledge, Financial Risk Tolerance and Financial Literacy Categories

Financial Knowledge Categories

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Little	54	22.1	22.1	22.1
Some	153	62.7	62.7	84.8
A Lot	37	15.2	15.2	100.0
Total	244	100.0	100.0	

Financial Risk Tolerance Categories (High Vs Low)

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Low Risk tolerance	146	59.8	59.8	59.8
High Risk Tolerance	98	40.2	40.2	100.0
Total	244	100.0	100.0	

Financial Risk Score Categories

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Low risk tolerance	15	6.1	6.1	6.1
Below-average risk tolerance	64	26.2	26.2	32.4
Average/moderate risk tolerance	96	39.3	39.3	71.7
Above-average risk tolerance	48	19.7	19.7	91.4
High risk tolerance	21	8.6	8.6	100.0
Total	244	100.0	100.0	

Financial Literacy Categories

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Low Literacy	70	28.7	28.7	28.7
High Literacy	174	71.3	71.3	100.0
Total	244	100.0	100.0	

4.2.3 Descriptive Statistics for Decision Styles, Personality Traits, Investment Experience

The descriptive statistics for the investment experience showed that 38% of the respondents had more than 5 years of investing experience, 28.7% had no investment experience and 33% had one to five years of investment experience.

Table 4.3: Descriptive Statistics for Investment Experience Items

Investment Instruments

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
current account or deposit account	151	61.9	71.6	71.6
hedge funds or money market mutual funds	8	3.3	3.8	75.4
bonds and mutual funds investing primarily in bonds	17	7.0	8.1	83.4
mixed mutual funds	11	4.5	5.2	88.6
equities/equity mutual funds	17	7.0	8.1	96.7
exchange-traded derivatives	5	2.0	2.4	99.1
OTC derivatives	2	.8	.9	100.0
Total	211	86.5	100.0	
System	33	13.5		
	244	100.0		

Investment Experience (Number of years investing)

	Frequency	Percent	Valid Percent	Cumulative Percent
No experience	70	28.7	28.7	28.7
1 to 5 yrs experience	81	33.2	33.2	61.9
More than 5 yrs experience	93	38.1	38.1	100.0
Total	244	100.0	100.0	

Investment Frequency (How often do you invest?)

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Less than Once a Month	79	32.4	56.0	56.0
Once a Month	49	20.1	34.8	90.8
2-3 Times a Month	10	4.1	7.1	97.9
Once a Week	1	.4	.7	98.6
2-3 Times a Week	2	.8	1.4	100.0
Total	141	57.8	100.0	
System	103	42.2		
	244	100.0		

The personality traits were divided into categories and the frequency and percentages showed that 48% of the respondents were introvert, 51.6% extravert. 88% of the respondents were high in agreeableness and 11.9% were high on antagonism. 69% were emotionally stable and 30.7% had neuroticism trait. 83.6% had conscientiousness and 74% had the trait of openness to experience.

Table 4.4: Descriptive Statistics for the personality trait categories

Personality Traits Categories

Extraversion Vs Introversion				
	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Introversion	118	48.4	48.4	48.4
Extraversion	126	51.6	51.6	100.0
Total	244	100.0	100.0	
Agreeableness Vs Antagonism				
	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Antagonism	29	11.9	11.9	11.9
Agreeableness	215	88.1	88.1	100.0
Total	244	100.0	100.0	
Neuroticism Vs Emotional Stability				
	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Emotional Stability	169	69.3	69.3	69.3
Neuroticism	75	30.7	30.7	100.0
Total	244	100.0	100.0	
Conscientiousness Vs Undirectedness				
	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Undirectedness	40	16.4	16.4	16.4
Conscientiousness	204	83.6	83.6	100.0
Total	244	100.0	100.0	
Openness to Experience Vs Non Openness				
	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Non Openness	63	25.8	25.8	25.8
Openness to Experience	181	74.2	74.2	100.0
Total	244	100.0	100.0	

The decision-making styles categories descriptive statistics showed that 57% of the respondents used intuitive decision-making style 30.7% made spontaneous decisions and 93% were rational/vigilant decision makers.

Table 4.5: Descriptive Statistics for Decision Making Styles Categories

Decision Making Style Categories

Intuition Vs Non-Intuitive

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Non-Intuitive	104	42.6	42.6	42.6
Intuitive	140	57.4	57.4	100.0
Total	244	100.0	100.0	

Spontaneous Vs Non-Spontaneous

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Non-Spontaneous	169	69.3	69.3	69.3
Spontaneous	75	30.7	30.7	100.0
Total	244	100.0	100.0	

Rational Vs Irrational

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Irrational	17	7.0	7.0	7.0
Rational	227	93.0	93.0	100.0
Total	244	100.0	100.0	

4.2.4 Financial Literacy Percentages

The following table shows the frequency and percentage of the questions answered correctly by the respondents. The highest number of correct answers were 8 which were answered by 13.1% of the respondents and 12.3% respondents answered all 11 questions correctly.

Table 4.6: Frequency and percentage of number of questions answered correctly

Financial Literacy

	Frequency	Percent
0	10	4.1
1	5	2.0
2	6	2.5
3	16	6.6
4	11	4.5

5	22	9.0
6	27	11.1
7	30	12.3
8	32	13.1
9	26	10.7
10	29	11.9
11	30	12.3
Total	244	100.0

The following table gives us the information about frequency and percentage of the how many basic and advanced financial literacy questions the respondents answered right. The highest percentage of respondents 39.8% (97) answered 2 out of 3 questions correctly while 30.3% answered all three questions correctly. The 19.3% of the respondents answered all eight questions of advanced financial literacy correctly.

Table 4.7: Frequencies and Percentages of Basic and Advanced Financial Literacy questions answered right

Basic_Financial_Literacy

	Frequency	Percent
0	27	11.1
1	46	18.9
2	97	39.8
3	74	30.3
Total	244	100.0

Advanced_Financial_Literacy

	Frequency	Percent
0	14	5.7
1	14	5.7
2	10	4.1
3	21	8.6
4	24	9.8
5	44	18.0
6	40	16.4
7	30	12.3
8	47	19.3
Total	244	100.0

4.2.5 Descriptive Statistics for Iowa Gambling Task Performance

According to the criteria given by Glicksohn et al.(2007) Risk Aversion (number of cards selected from decks C and D i.e. RA=C+D) being greater than 50 to be considered as normal performance out of the 244 participants 44.3% of the participants i.e. 108 had 'normal' performance (out of which 60 were females) and 55.7% i.e. 136 non normal performance (71 were female participants).

Table 4.8: Descriptive Statistics for Iowa Gambling Task Performance

	Frequency	Percent	Valid Percent	Cumulative Percent
Non Normal Performance	135	55.6	55.6	55.6
Normal Performance	108	44.4	44.4	100.0
Total	243	100.0	100.0	

4.2.6 Card Selection from the four decks

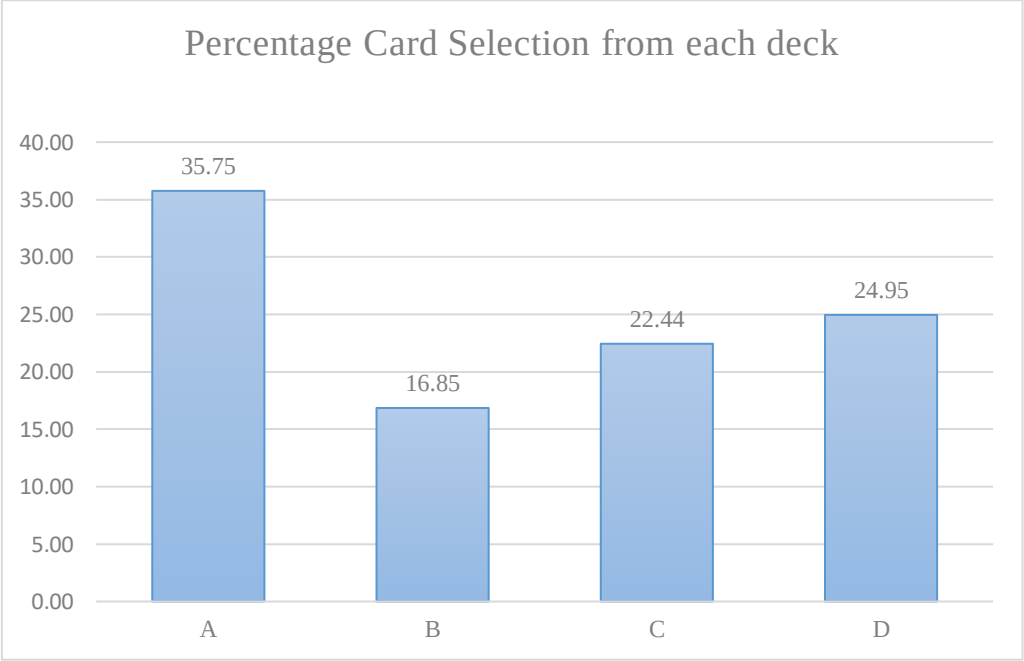

Figure 4.1: Percentage Mean Cards Selection from each deck

The highest percentage of cards 35.75 were selected from the disadvantageous deck A, then 24.95% from deck D, 22.44% from deck C (advantageous decks) and 16.85% cards were

selected from deck B. The following table gives us information about the mean number of cards selected from each deck in each of the blocks:

Table 4.9: Mean Number of cards selected from each deck

Deck	Blocks					Mean
	1	2	3	4	5	
A	6.9	8.0	7.2	6.8	6.8	35.8
B	4.3	3.3	3.3	3.1	2.9	16.8
C	4.1	4.2	4.4	4.8	5.0	22.4
D	4.7	4.5	5.1	5.4	5.2	25.0

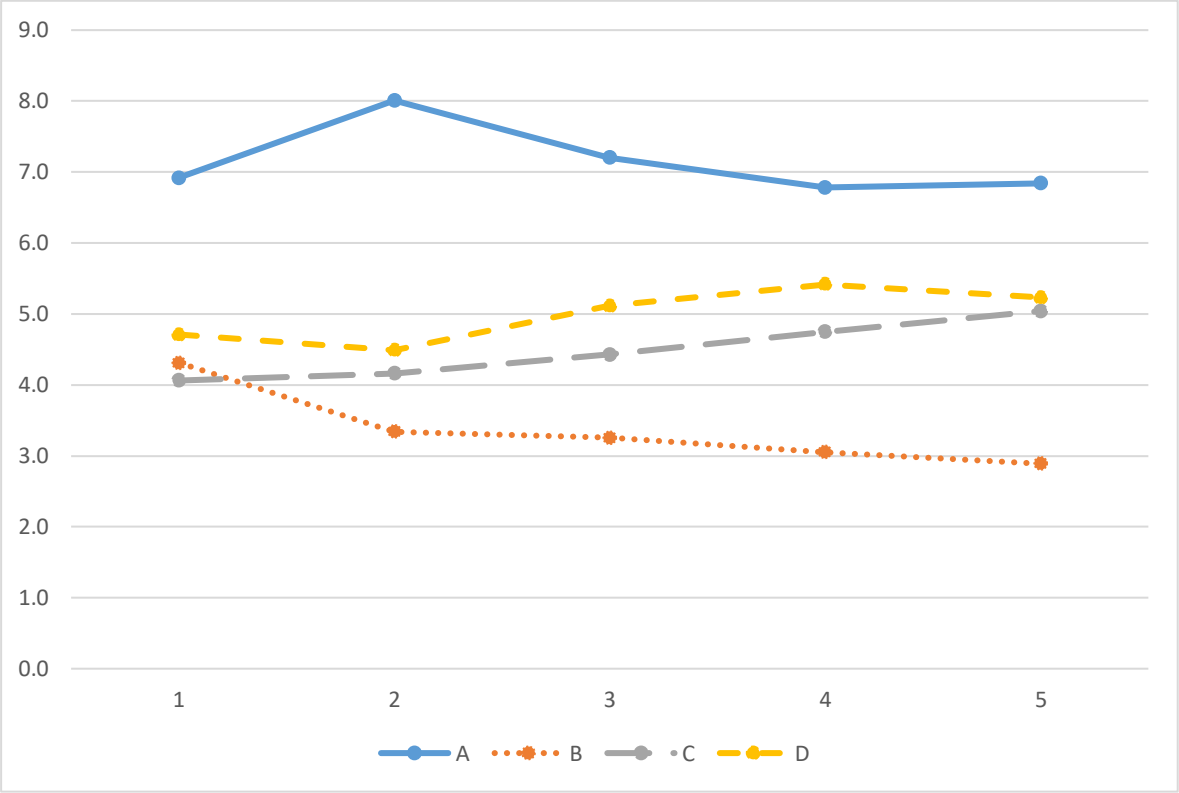

Figure 4.2: Mean number of cards selected from each deck over the 5 Blocks of Trials

The mean number of cards selected from deck B gradually decreased with every block from 4.31 to 2.89 and an increase in selections from deck C and D with mean number of selections increasing from 4.06 to 5.04 and 4.71 to 5.23 respectively was seen but the card selections from deck A did not decline as significantly and a minimal change from 6.92 to

6.8 cards per block was seen. Which means that though the deck A was a disadvantageous and high frequent losses deck still the participants did keep selecting cards from it in all blocks.

4.2.7 Relationship between Variables using Pearson Correlation

4.2.7.1 Demographics and Financial Literacy

The Pearson correlation calculation (See *Table 4.10: Relationship among the Variables calculated using Pearson Correlations*) shows that there is a moderate negative relationship between gender and financial literacy ($r= -0.4$, $n=244$, $p<0.01$) (where male=1 and female=2). There is a weak negative relationship between gender and basic financial literacy ($r= -0.33$, $n=244$, $p<0.01$), advanced financial literacy ($r= - 0.36$, $n=244$, $p<0.01$) and financial knowledge ($r= -0.32$, $n=244$, $p<0.01$). There is a weak negative relationship between financial risk score and gender ($r= -0.28$, $n=244$, $p<0.01$) and a very weak negative relationship between gender and investment experience ($r= -0.18$, $n=244$, $p<0.01$). There is a weak positive relationship between gender and neuroticism ($r=0.23$, $n=244$, $p<0.01$). Therefore, it can be concluded that females have more neuroticism personality trait and less financial literacy, basic financial literacy, advanced financial literacy, financial knowledge and investment experience than men.

Age had a weak positive relationship with financial literacy ($r=0.24$, $n=244$, $p<0.01$), basic financial literacy ($r=0.23$, $n=244$, $p<0.01$), advanced financial literacy ($r=0.21$, $n=244$, $p<0.01$) and financial knowledge ($r=0.211$, $n=244$, $p<0.01$). Age and investment experience have weak positive relationship ($r= 0.33$, $n=244$, $p<0.01$) while age and neuroticism have a very weak negative relationship ($r= -0.19$, $n=244$, $p<0.01$) and age and conscientiousness have a very weak positive relationship ($r=0.16$, $n=244$, $p<0.05$).

Education had a weak positive relationship with financial literacy ($r= 0.23$, $n=244$, $p<0.01$) and advanced financial literacy ($r=0.23$, $n=244$, $p<0.01$) and a very weak positive

relationship with basic financial literacy (r=0.15, n=244, p<0.05). Education had a very weak positive relationship with financial risk tolerance score (r=0.13, n=244, p<0.05) and a weak negative relationship with intuition decision making style (r= -0.25, n=244, p<0.01).

4.2.7.2 Financial Literacy, Basic and Advanced Financial Literacy and Financial Knowledge

The Pearson correlation calculation showed a strong relationship between financial literacy and the basic financial literacy (r=0.74, n=244, p<0.01) while a very strong positive relationship between the financial literacy and advance financial literacy (r= 0.96, n=244, p<0.01). Thus, financial literacy is more dependent on the advanced financial literacy as its 8 questions sum and basic financial literacy only comprises of 3 questions. The relationship between financial literacy and financial knowledge was found to be weak positive (r=0.28, n=244, p<0.01). The basic financial literacy and advanced financial literacy have a moderate positive relationship (r=0.53, n=244, p<0.01) and a very weak positive relationship between basic financial literacy and financial knowledge (r=0.18, n=244, p<0.01). There is a weak relationship between advanced financial literacy and financial knowledge (r=0.29, n=244, p<0.01).

4.2.7.3 Investment Experience, Perceived Financial Knowledge and Financial Literacy

There was a moderate positive relationship between investment experience and financial literacy (r=0.411, n=244, p<0.01) and advanced financial literacy (r= 0.41, n=244, p<0.01). There was weak positive relationship between investment experience and basic financial literacy (r=0.28, n=244, p<0.01) and financial knowledge (r=0.28, n=244, p<0.01). Financial risk tolerance score was found to be weakly related to financial literacy (r=0.34, n=244, p<0.01), advanced financial literacy (r=0.36, n=244, p<0.01), financial knowledge (r= 0.27, n=244, p<0.01) and very weakly related to basic financial literacy (r=0.17, n=244, p<0.05).

Table 4.10: Relationship among the Variables calculated using Pearson Correlations

Correlations

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	Financial_Literacy	1																						
2	Basic_Financial_Literacy	.743**	1																					
3	Advanced_Financial_Literacy	.962**	.533**	1																				
4	financial_knowledge	.282**	.177**	.285**	1																			
5	Gender	.395**	.334**	.364**	.323**	1																		
6	Age	.240**	.232**	.209**	.211**	-.253**	1																	
7	Education	.232**	.152*	.232**	.098	-.066	-.148*	1																
8	Financial_Score	.339**	.171**	.359**	.266**	-.275**	.019	.126*	1															
9	InvestmentExp	.411**	.281**	.406**	.280**	-.176**	.331**	.032	.206**	1														
10	Extraversion	.068	.006	.083	.231**	-.027	.007	.075	.252**	.118	1													
11	Agreeableness	.021	.039	.010	-.026	.045	.045	-.087	-.066	.022	.179**	1												
12	Neuroticism	-.237**	-.257**	-.195**	-.226**	.225**	-.187**	-.100	-.208**	-.156*	-.444**	-.156*	1											
13	Conscientiousness	.136*	.123	.122	.206**	.028	.156*	-.033	-.030	.218**	.303**	.325**	-.376**	1										
14	Openness	.190**	.101	.199**	.237**	-.071	.047	.095	.166**	.179**	.466**	.191**	-.262**	.309**	1									
15	Intuition	-.171**	-.195**	-.136*	-.003	.100	-.052	-.245**	.034	-.119	.173**	.217**	-.020	.136*	.164*	1								
16	Spontaneous	-.053	-.140*	-.011	-.026	-.024	-.070	-.035	.207**	-.105	.269**	-.015	-.045	-.181**	.130*	.455**	1							
17	Vigilance	.158*	.159*	.135*	.033	-.036	.121	-.082	-.102	.152*	.106	.331**	-.110	.488**	.336**	.210**	-.128*	1						
18	A	-.062	.000	-.078	-.063	.054	.080	-.032	-.094	-.080	.017	.100	.039	.107	-.052	.025	-.047	-.033	1					
19	B	-.090	-.137*	-.057	.153*	-.071	.014	-.016	.157*	-.049	.024	-.099	.002	-.125	.016	.061	.196**	-.104	-.189**	1				
20	C	.137*	.178**	.101	.055	-.079	-.036	.006	.077	.179**	-.093	-.050	-.024	-.056	-.058	-.038	-.076	.031	-.594**	-.220**	1			
21	D	-.031	-.122	.010	-.101	.084	-.061	.042	-.095	-.089	.077	.012	-.018	.030	.122	-.027	.010	.075	-.333**	-.217**	-.362**	1		
22	Explosions	.088	-.012	.117	-.023	-.029	-.169**	.068	.088	.046	.018	.058	.017	-.022	.098	-.007	.039	.028	.001	.008	-.013	.009	1	
23	Avg_PumpCount	.117	.059	.123	-.035	-.004	-.177**	.104	.077	.057	.029	.058	-.023	.044	.082	-.007	-.029	.051	-.028	-.033	.079	-.041	.866**	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

4.3 Statistical Analysis for the hypotheses related to RQ1

4.3.1 Financial Risk Tolerance Score and Demographic Variables (H1a)

The male respondents were found to be more risk tolerant than females as 55% of males were in the high risk tolerant category and 29% of females were high risk tolerant. According to the five risk tolerance categories 34% of the females had below average risk tolerance and 18% of the males had below average risk tolerance.

Table 4.11: Frequency and percentage of financial risk tolerance categories according to gender

Gender		Frequency	Percent
Male	High Financial Risk Tolerance	62	54.9
	Low Financial Risk Tolerance	51	45.1
	Total	113	100.0
Female	High Financial Risk Tolerance	38	29.0
	Low Financial Risk Tolerance	93	71.0
	Total	131	100.0

Gender		Frequency	Percent
Male	Low risk tolerance	5	4.4
	Below-average risk tolerance	20	17.7
	Average/moderate risk tolerance	46	40.7
	Above-average risk tolerance	27	23.9
	High risk tolerance	15	13.3
	Total	113	100.0
Female	Low risk tolerance	10	7.6
	Below-average risk tolerance	44	33.6
	Average/moderate risk tolerance	50	38.2
	Above-average risk tolerance	21	16.0
	High risk tolerance	6	4.6
	Total	131	100.0

H: Females have low financial risk tolerance as compared to males

The independent samples T-Test was calculated to identify gender differences in financial risk tolerance scores. The results show that the females had significantly lower financial

risk tolerance score (24.24±4.683) as compared to the males (27.01±5.040), t (239) =4.416, p<0.000. Therefore, the null hypothesis is rejected and it is concluded that financial risk tolerance score does differ significantly among the male and female respondents and females have low financial risk tolerance as compared to males.

Table 4.12: Independent Samples T-Test for Gender differences in Financial Risk Tolerance Score

Group Statistics

Gender		N	Mean	Std. Deviation	Std. Error Mean
Financial_Score	Male	113	27.01	5.040	.474
	Female	128	24.24	4.683	.414

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Financial_Score	Equal variances assumed	.179	.673	4.416	239	.000
	Equal variances not assumed			4.396	229.979	.000

H: Older individuals have low financial risk tolerance as compared to younger individuals

H: Highly educated individuals have higher financial risk tolerance as compared to less educated ones

The One-Way ANOVA calculation for Age, Education, Ethnicity and Employment Status showed that there are no significant differences in the financial risk tolerance of respondents based on age as ANOVA (F (4,236) =1.107, p=0.354), education (F (8,234) =1.066, p=0.388), Ethnicity (F (5,237) =1.110, p=0.990) and Employment Status (F (7,233) =1.056, p=0.393).

Table 4.13: One-Way ANOVA for differences in financial Risk Tolerance Score based on Age, Ethnicity, Education and Employment Status

Age	N	Mean	Std. Deviation	F	Sig.
18-25	11	27.82	3.157	1.107	.354
26-34	35	25.26	5.187		
35-54	122	25.07	5.129		
55-64	51	26.12	4.685		
65 or Over	22	26.14	5.701		
Total	241	25.54	5.037		

Education	N	Mean	Std. Deviation	F	Sig.
Some high school, no diploma	15	23.40	4.085	1.066	.388
High school graduate, diploma or the equivalent (for example: GED)	24	23.79	5.004		
Some college credit, no degree	20	26.60	5.753		
Trade/technical/vocational training	23	25.35	4.877		
Associate degree	8	24.50	5.806		
Bachelor's degree	81	25.83	5.091		
Master's degree	46	26.26	5.179		
Professional degree	19	25.42	3.849		
Doctorate degree	7	26.71	4.889		
Total	243	25.53	5.022		

Ethnicity	N	Mean	Std. Deviation	F	Sig.
White British (English/Welsh/Scottish/Northern Irish/British)	200	25.61	5.275	.110	.990
White (Irish, European, traveller, Gypsy)	9	24.44	2.963		
Black (Black British, African, Caribbean)	6	25.00	4.195		
Asian (Asian British, Indian, Pakistani, Bangladeshi, Chinese, Japanese)	18	25.33	4.187		
Middle Eastern/Arab	3	25.67	1.155		
Mixed/Multiple heritage	7	25.57	3.910		
Total	243	25.53	5.022		

Employment Status	N	Mean	Std. Deviation	F	Sig.
Employed for wages	141	25.50	5.265	1.056	.393
Self-employed	26	25.54	3.870		
Out of work and looking for work	5	24.80	6.419		
Out of work but not currently looking for work	3	21.33	3.215		
A homemaker	10	23.00	4.397		
A student	18	26.83	3.808		
Retired	33	26.45	4.963		
Unable to work	5	24.20	7.950		
Total	241	25.54	5.037		

4.3.1.1 Financial Risk Tolerance Score differences based on Investment Experience

H: There are significant differences in financial risk tolerance scores based on investment experience

The financial risk tolerance score was significantly different among the investment experience in years as determined by the One-Way ANOVA ($F(1,241) = 19.07$, $p<0.001$). The Tukey Post Hoc test revealed that the respondents who had no investment experience had low financial risk tolerance score (22.89±3.89) than the 1-5 years' investment experience (27.58±4.69, $p<0.001$) and more than 5 years of investment experience (25.73±5.18, $p<0.001$). The financial risk tolerance score was significantly higher for the 1-5 years' investment experience (27.58±4.69) than the more than 5 years' investment experience (25.73±5.18, $p=0.027$). It is also clear from the means plot (See Figure 9) that the investors have high financial risk tolerance than the non-investors but higher the investment experience is the investors become cautious and thus do not become risk tolerant above a certain level.

Table 4.14: One Way ANOVA for financial risk tolerance score differences based on investment experience

Financial Risk Tolerance Score

	N	Mean	Std. Deviation	F	Sig.
No experience	70	22.89	3.892	19.066	.000
1 to 5 yrs experience	81	27.58	4.685		
More than 5 yrs experience	93	25.73	5.180		
Total	244	25.53	5.011		

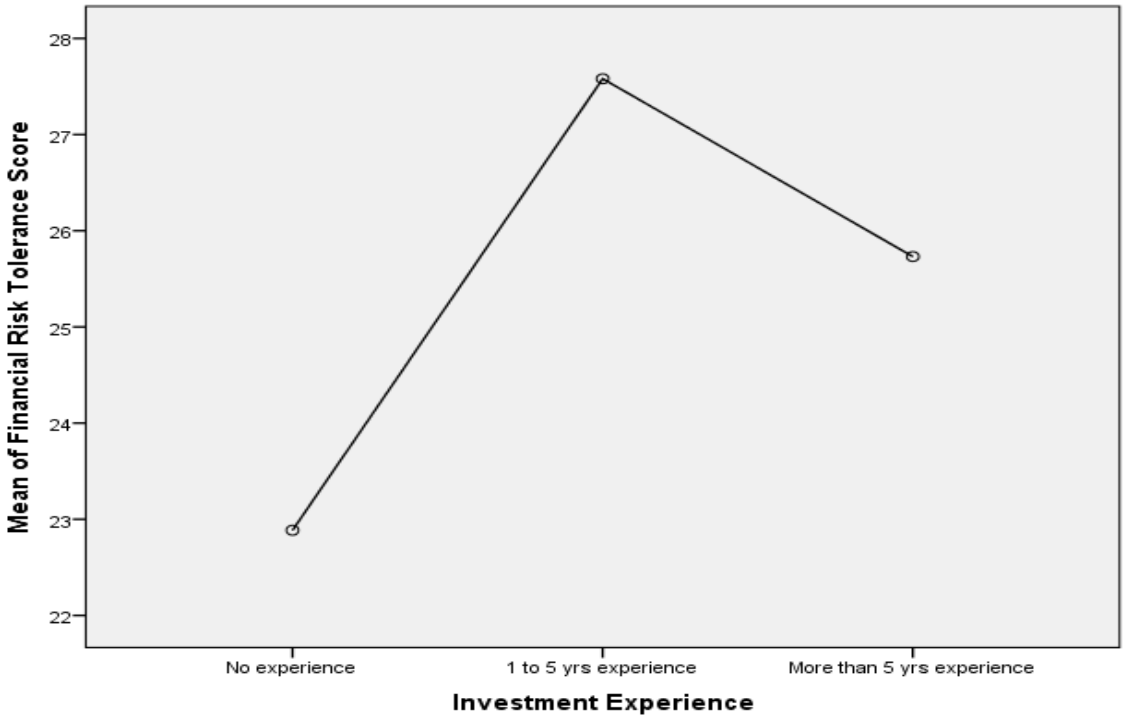

Figure 4.3: Means Plots for One Way ANOVA

4.3.1.2 Financial Risk Tolerance score differences based on Investment Instrument

H: There are significant differences in financial risk tolerance score based on investment instruments

The financial risk tolerance score was significantly different among the investment instruments as determined by the One-Way ANOVA (F (6,204) = 5.775, p=0.000). The Tukey Post Hoc test revealed that the respondents who have invested in equity/equity mutual funds (29.12±5.048, p=0.001) and hedge funds or money market mutual funds (30.75±5.064, p=0.003) have significant higher financial risk tolerance than the respondents who have only invested in current account or deposit accounts (24.25±4.531). There were no significant differences in respondent's financial risk tolerance score of investors who have investing experience in other financial instruments.

Table 4.15: One Way ANOVA for the differences in financial risk tolerance score based on Investment instrument

ANOVA

Investment Knowledge		N	Mean	Std. Deviation	F	Sig.
Financial Risk Tolerance Score	current account or deposit account	151	24.25	4.531	5.775	.000
	hedge funds or money market mutual funds	8	30.75	5.064		
	bonds and mutual funds investing primarily in bonds	17	25.82	4.902		
	mixed mutual funds	11	26.73	4.777		
	equities/equity mutual funds	17	29.12	5.048		
	exchange-traded derivatives	5	29.00	4.848		
	OTC derivatives	2	24.50	6.364		
	Total	211	25.26	4.959		

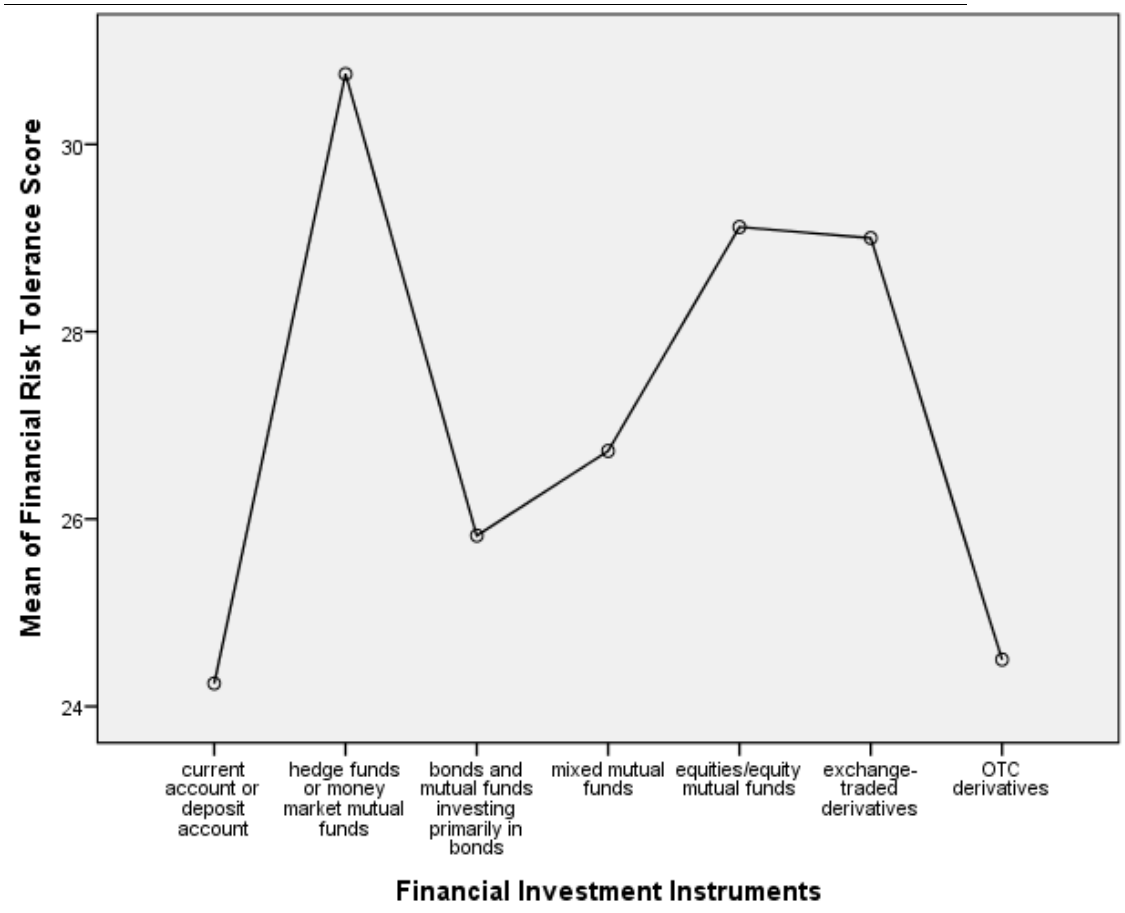

Figure 4.4: Means Plot for One Way ANOVA

4.3.1.3 Relationship, Association and differences in financial risk tolerance based on Financial knowledge and investment experience

H: There is significant association between financial risk tolerance, financial knowledge and investment experience categories

The Cross tabulation and Pearson Chi Square were calculated to see the association between different categories of financial risk tolerance, gender and different levels of financial knowledge and investment experience. The following table gives us details of the cross tabulation:

Table 4.16: Cross Tabulation results of Financial Risk Tolerance, Gender, financial knowledge and Investment Experience

Cross Tabulation

		Gender		Financial Knowledge			Investment Experience			
		Male	Female	Little	Some	A Lot	No experience	1 to 5 yrs experience	More than 5 yrs experience	Total
Financial Risk Category	High Risk Tolerance	62	38	8	72	20	11	49	40	100
	Low Risk Tolerance	51	93	46	81	17	59	32	53	144
Total		113	131	54	153	37	70	81	93	244

There was a significant association between gender and financial risk tolerance categories as $\chi 2 = 16.723$, $p<.001$. The odds ratio represents that male participants are 2.98 times more risk tolerant than female respondents. (Odds(Male)= 61/52= 1.17, Odds (Female)= 37/94= 0.39, Odds Ratio= 2.98) The crosstabs show us that out of the 113 males 61 participants were high in financial risk tolerance as compared to 52 being low financial risk tolerant. 37 had high and 94 low in financial risk tolerance out of the 131. According to the Phi value

there is high financial risk tolerance in males as compared to females. The level of association 0.262 reflects moderately strong relationship for the sample.

There was also a significant association between high risk tolerance financial knowledge and investment experience as $\chi 2 = 20.237$, $p<.001$ and $\chi 2 = 31.386$, $p<.001$ respectively. The level of association 0.288 for financial knowledge (moderately strong) and 0.359 for investment experience (very strong).

4.3.2 Financial Risk Tolerance and Personality Traits (H1b)

4.3.2.1 Financial Risk Tolerance Categories and Personality Traits

H1b: Personality traits significantly differ among the financial risk tolerance categories

The financial risk tolerance categories differ according to the personality traits extraversion, Neuroticism and Openness to experience. The financial risk tolerance categories differ in the personality trait extraversion as the One-Way ANOVA (F (4,236) =5.325, p=0.000). The Tukey Post hoc Test revealed that above average risk tolerance respondents score high (3.41±0.758) on the extraversion trait than the below average risk tolerant (2.8±0.783, p=0.001) and average/moderate risk tolerant respondents (3±0.716, p=023). Therefore, high risk is related to being more extravert and less introvert. The One-Way ANOVA result showed no significant differences among the financial risk tolerance categories according to the personality trait agreeableness (F (4,236) =0.491, p=0.742) and conscientiousness (F (4,236) =0.285, p=0.888).

The financial risk tolerance categories differ among score on the personality trait neuroticism as the One-Way ANOVA (F (4,236) =4.064, p=0.003). The Tukey Post hoc Test revealed that above average risk tolerance respondents score low (2.51±0.646) on the neuroticism trait than the below average risk tolerant (3.01±0.713, p=0.002) respondents. Therefore, high risk tolerance is related to being more emotionally stable.

The financial risk tolerance categories differ among score on the personality trait Openness to experience as the One-Way ANOVA (F (4,236) =2.529, p=0.041). The Tukey Post hoc Test revealed no significant differences among the financial risk tolerance categories.

Table 4.17: One Way ANOVA for differences in personality and financial risk tolerance categories

ANOVA

		N	Mean	Std. Deviation	F	Sig.
Extraversion	Low risk tolerance	15	2.89	.800	5.325	.000
	Below-average risk tolerance	63	2.80	.783		
	Average/moderate risk tolerance	94	3.00	.716		
	Above-average risk tolerance	48	3.41	.758		
	High risk tolerance	21	3.29	.826		
	Total	241	3.05	.784		
Agreeableness	Low risk tolerance	15	3.73	.454	.491	.742
	Below-average risk tolerance	63	3.63	.508		
	Average/moderate risk tolerance	94	3.59	.476		
	Above-average risk tolerance	48	3.66	.459		
	High risk tolerance	21	3.54	.529		
	Total	241	3.62	.483		
Neuroticism	Low risk tolerance	15	2.88	.926	4.064	.003
	Below-average risk tolerance	63	3.01	.713		
	Average/moderate risk tolerance	94	2.71	.702		
	Above-average risk tolerance	48	2.51	.646		
	High risk tolerance	21	2.62	.516		
	Total	241	2.75	.714		
Conscientiousness	Low risk tolerance	15	3.90	.683	.285	.888
	Below-average risk tolerance	63	3.72	.683		
	Average/moderate risk tolerance	94	3.74	.618		
	Above-average risk tolerance	48	3.79	.662		
	High risk tolerance	21	3.74	.612		
	Total	241	3.76	.644		
Openness	Low risk tolerance	15	3.37	.648	2.529	.041
	Below-average risk tolerance	63	3.35	.623		
	Average/moderate risk tolerance	94	3.35	.496		
	Above-average risk tolerance	48	3.58	.603		
	High risk tolerance	21	3.66	.684		
	Total	241	3.42	.587		

4.3.2.2 Financial risk Tolerance Score and Personality Traits

H: Personality traits are significantly related to financial risk tolerance Score

The Pearson correlation calculation showed that among the personality traits extraversion was positively related (r=0.252, n=244, p<0.001), openness to experience positively related (r=0.166, n=244, p<0.001) and neuroticism negatively related (r= -208, n=244, p<0.001) to financial risk tolerance score (See *Table 4.10: Relationship among the Variables calculated using Pearson Correlations*).

4.3.3 Financial Risk Tolerance and Decision-Making Styles (H1c)

H: There is a significant relationship between decision making styles and financial risk tolerance

A weak positive relationship with spontaneous decision-making style (r=0.207, n=244, p<0.001). No significant relationship was found between financial risk tolerance score and intuitive decision making and rational decision-making styles (See *Table 4.10: Relationship among the Variables calculated using Pearson Correlations*).

4.3.4 Differences in Basic and Advanced Financial Literacy Among Demographic Variables (H2a)

The independent sample T-Test and One-Way ANOVA was calculated to identify the differences in basic and advanced financial literacy among demographic variables.

4.3.4.1 Financial Knowledge and Basic and Advanced Financial Literacy

The basic financial literacy was significantly different among the financial knowledge levels as determined by the One-Way ANOVA (F (2,241) =4.233, p=0.016). The Tukey Post Hoc test revealed that the respondents with little perceived financial knowledge had lower basic financial literacy (1.69±0.97) than the respondents with 'a lot' perceived financial literacy, (2.27±0.96, p=0.012). There were no significant differences in the basic financial literacy of the other groups.

The advanced financial literacy was also significantly different among the financial knowledge levels as determined by the One-Way ANOVA (F (2,241) = 10.656, p=0.000). The Tukey Post Hoc test revealed that respondents with little perceived financial knowledge had lower advanced financial literacy (4.07±2.46) than both the respondents with 'some' (5.14±2.23, p=0.01) and 'a lot' perceived financial knowledge (6.30±2.16, p=0.000).

Table 4.18: One Way ANOVA for the differences in basic and advanced financial literacy based on Financial Knowledge

Financial Knowledge		N	Mean	Std. Deviation	F	Sig.
Basic_Financial_Literacy	Little	54	1.69	.968	4.233	.016
	Some	153	1.88	.941		
	A Lot	37	2.27	.962		
	Total	244	1.89	.963		
Advanced_Financial_Literacy	Little	54	4.07	2.456	10.656	.000
	Some	153	5.14	2.230		
	A Lot	37	6.30	2.159		
	Total	244	5.08	2.360		

4.3.4.2 Perceived Financial Knowledge and Actual Financial Knowledge/Literacy

The following table shows the number and percentages of respondents which according to their self-reported level of financial knowledge showed high or low financial literacy.

Table 4.19: Perceived and Actual Levels of Financial Knowledge

Financial Knowledge		N	Percentage
Little	High Literacy	32	59%
	Low Literacy	22	41%
Some	High Literacy	108	71%
	Low Literacy	45	29%
A Lot	High Literacy	34	92%
	Low Literacy	3	8%

4.3.4.3 Association between Perceived and Actual Financial Knowledge

Cross tabulation and chi square was calculated to see for association among the perceived and actual levels of financial knowledge.

Table 4.20: Cross Tabulation for Perceived Financial Knowledge and Financial Literacy/ Actual Financial Knowledge

Financial Knowledge * Financial Literacy Cross tabulation

		Financial Literacy		
		High Literacy	Low Literacy	Total
Financial Knowledge	Little	32	22	54
	Some	108	45	153
	A Lot	34	3	37
Total		174	70	244

There was a significant association between perceived financial knowledge and actual financial knowledge/ Financial Literacy as $\chi 2 = 11.533$, $p<.001$. The level of association 0.217 calculated using Phi and Cramer's V which reflects a moderately strong association. Thus, it can be said that the confidence that an individual has about his/her financial knowledge is associated with the actual level of that individual's financial literacy.

4.3.4.4 Relationship between Perceived and Actual Financial Knowledge

The relationship between the perceived financial knowledge and actual financial knowledge/literacy was calculated using Pearson correlation. The strength of the relationship is considered according to the criteria given by (Evans, 1996) where 0.00-0.19 "very weak", 0.20-0.39 "weak", 0.40-0.59 "moderate", 0.60-0.79 "strong", 0.80-1.0 "very strong".

There was a weak positive correlation between the two variables $r=0.282$, $n=244$, $p<0.000$. The Pearson correlation was calculated between the two variables for different demographic variables as well. There was a weak positive significant relationship for males

(r=0.234, n=113, p<0.05), strong positive significant relationship for age range 18-25 (r=0.703, n=11, p<0.05), moderate positive significant and weak positive significant relationship for age groups 26-34 (r=0.504, n=35, p<0.01) and 55-64 (r=0.32, n=51, p<0.05) respectively. There was a strong positive significant relationship for respondents having professional degree (r=0.60, n=19, p<0.01) while a moderate relationship for some college and trading/technical/ vocational training education and a weak relationship for bachelor's degree holders. Among the other demographic variables self-employed individuals had strong positive relationship between perceived financial knowledge and actual financial knowledge/literacy (r=0.68, n= 26, p<0.01), the individuals with more than 5 years of experience (r= 0.286, n=98, p<0.01) and high-risk tolerance (r=0.329, n= 100, p<0.01) had weak positive significant correlation.

Table 4.21: Correlations between Perceived and Actual Financial Knowledge for different groups of demographics

Gender	N	Correlations
Male	113	.234*
Female	131	0.134
Age	N	Correlations
18-25	11	.703*
26-34	35	.504**
35-54	122	0.115
55-64	51	.320*
65 or Over	22	0.201
Education	N	Correlations
Some high school, no diploma	15	0.361
High school graduate, diploma or the equivalent (for example: GED)	24	0.099
Some college credit, no degree	20	.505*
Trade/technical/vocational training	23	.475*
Associate degree	8	0.076
Bachelor's degree	81	.284*
Master's degree	46	0.002
Professional degree	19	.601**
Doctorate degree	7	-0.637
Employment Status	N	Correlations
Employed for wages	141	.204*

Self-employed	26	.682**
Out of work and looking for work	5	0.089
A homemaker	10	0.38
A student	21	.538*
Retired	33	0.28
Unable to work	5	-0.045
Investment Experience	N	Correlations
No experience	70	-0.176
1 to 5 years' experience	81	.270*
More than 5 years' experience	93	.286**
Financial Risk Tolerance	N	Correlations
High Risk Tolerance	100	.324**
Low Risk Tolerance	144	.165*

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

H: Male respondents (basic and advanced) financial literacy is significantly higher than females

The independent samples T-Test was calculated to identify gender differences in basic and advanced financial literacy (See Table 4.22: Independent Samples T-Test for Gender differences in Basic and Advanced Financial Literacy). The results show that the females had significantly lower basic financial literacy (1.6±0.96) as compared to the males (2.2±0.85), t (242) =5.512, p=0.000. The females advanced financial literacy is also significantly lower (4.3±2.3) as compared to the males (6.0±2.1), t (242) =6.07, p=0.000. Therefore, it can be concluded that the male respondents had significantly higher basic and advanced financial literacy as compared to females.

Table 4.22: Independent Samples T-Test for Gender differences in Basic and Advanced Financial Literacy

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Basic_Financial_Literacy	Equal variances assumed	3.534	.061	5.512	242	.000
	Equal variances not assumed			5.562	241.843	.000
Advanced_Financial_Literacy	Equal variances assumed	2.717	.101	6.072	242	.000
	Equal variances not assumed			6.117	241.426	.000

4.3.5 Age and differences in Basic and Advanced Financial Literacy

H: The respondent's basic and advanced financial literacy significantly differs among different age groups

The basic financial literacy was significantly different among different age groups as determined by the One-Way ANOVA (F (5,238) =3.150, p= 0.09. The Tukey Post Hoc test revealed that the age group (18-25) had lower basic financial literacy (1.09±1,04) than age groups (55-64), (2.1±0.88, p=0.018) and (65 or over) (2.27±0.83, p=0.01). There were no significant differences in the basic financial literacy of the other age groups.

The advanced financial literacy was significantly different among different age groups as determined by the One-Way ANOVA (F (5,238) =2.81, p= 0.017. The Dunnett Post Hoc test revealed that the age group (35-54) had lower advanced financial literacy (4.9±2.4) than age group (65 or over), (6.2±1.95, p=0.048). There were no significant differences in the advanced financial literacy of other age groups.

Table 4.23: One Way ANOVA for the differences in basic and advanced financial literacy based on Age

ANOVA

Age		N	Mean	Std. Deviation	F	Sig.
Basic_Financial_Literacy	18-25	11	1.09	1.044	3.150	.009
	26-34	35	1.77	.942		
	35-54	122	1.86	.973		
	55-64	51	2.10	.878		
	65 or Over	22	2.27	.827		
	Total	244	1.89	.963		
Advanced_Financial_Literacy	18-25	11	4.82	2.639	2.808	.017
	26-34	35	4.69	2.298		
	35-54	122	4.87	2.398		
	55-64	51	5.57	2.211		
	65 or Over	22	6.23	1.950		
	Total	244	5.08	2.360		

4.3.6 Education and differences in Basic and Advanced Financial Literacy

H: There are significant differences in basic and advanced financial literacy based on the level of education

The basic financial literacy was not significantly different among the education levels as determined by the One-Way ANOVA (F (8,234) =1.432, p= 0.187. The advanced financial literacy was significantly different among the education levels as determined by the One-Way ANOVA (F (8,234) =2.587, p=0.01. But the post hoc tests did not show any significant differences in advanced financial literacy among the education levels.

Table 4.24: One Way ANOVA for the differences in basic and advanced financial literacy based on Education

ANOVA

Education		N	Mean	Std. Deviation	F	Sig.
Basic_Financial_Literacy	Some high school, no diploma	15	1.47	.915	1.267	.256
	High school graduate, diploma or the equivalent (for example: GED)	24	1.58	.974		
	Some college credit, no degree	20	1.65	.933		
	Trade/technical/vocational training	23	2.13	.920		
	Associate degree	8	2.00	.926		
	Bachelor's degree	81	1.90	.930		
	Master's degree	46	2.11	.994		
	Professional degree	19	2.05	1.026		
	Doctorate degree	7	1.71	1.113		
	Total	244	1.89	.963		
Advanced_Financial_Literacy	Some high school, no diploma	15	3.33	2.024	2.390	.013
	High school graduate, diploma or the equivalent (for example: GED)	24	4.42	2.412		
	Some college credit, no degree	20	4.30	2.618		
	Trade/technical/vocational training	23	4.96	2.585		
	Associate degree	8	4.88	2.295		
	Bachelor's degree	81	5.54	2.231		
	Master's degree	46	5.74	1.994		
	Professional degree	19	4.74	2.491		
	Doctorate degree	7	5.43	2.760		
	Total	244	5.08	2.360		

4.3.7 Employment Status and differences in Basic and Advanced Financial Literacy

H: There are significant differences in basic and advanced financial literacy based on employment status

The basic financial literacy was significantly different among the different employment status as determined by the One-Way ANOVA (F (7,236) =3.403, p= 0.02). The Tukey

Post Hoc test revealed that the retired respondents had higher basic financial literacy (2.42±0.83) than the unable to work, (1.00±0.71, p=0.034) and employed for wages (1.84±0.97, p=0.027). There were no significant differences in the basic financial literacy of the other groups.

The advanced financial literacy was not significantly different among different employment status as determined by the One-Way ANOVA (F (7,236) = 1.825, p=0.083).

Table 4.25: One Way ANOVA for the differences in basic and advanced financial literacy based on Employment Status

Employment Status		N	Mean	Std. Deviation	F	Sig.
Basic_Financial_Literacy	Employed for wages	141	1.84	.968	3.403	.002
	Self-employed	26	2.15	.784		
	Out of work and looking for work	5	1.40	.894		
	Out of work but not currently looking for work	3	1.00	1.732		
	A homemaker	10	1.60	.843		
	A student	21	1.71	.956		
	Retired	33	2.42	.830		
	Unable to work	5	1.00	.707		
	Total	244	1.89	.963		
Advanced_Financial_Literacy	Employed for wages	141	4.94	2.387	1.825	.083
	Self-employed	26	5.19	1.960		
	Out of work and looking for work	5	4.20	2.168		
	Out of work but not currently looking for work	3	4.33	4.041		
	A homemaker	10	3.50	2.014		
	A student	21	5.38	2.376		
	Retired	33	6.09	2.097		
	Unable to work	5	4.80	3.493		
	Total	244	5.08	2.360		

4.3.8 Investment Experience and differences in Basic and Advanced Financial Literacy

H: The basic and advanced financial literacy of respondents with more investment experience is significantly higher than those with less investment experience

The basic financial literacy was significantly different among the number of years of investing as determined by the One-Way ANOVA (F (2,241) = 11.54, p=0.000). The Tukey Post Hoc test revealed that the respondents with no experience had lower basic financial literacy (1.46±0.912) than the respondents with 1-5 years of experience (1.99±0.955, p=0.001) and the respondents with more than 5 years of experience (2.14±0.904, p=0.000).

The advanced financial literacy was significantly different among the number of years of investing experience determined by the One-Way ANOVA (F (2,241) = 33.015, 0.000). The Tukey Post Hoc test revealed that the respondents with no experience had lower advanced financial literacy (3.36±2.214) than the respondents with 1-5 years of experience (5.72±2.07, p=0.000) and the respondents with more than 5 years of experience (5.82±2.04, p=0.000). Therefore, it can be concluded that more investment experience is significantly related too higher basic and advanced financial literacy.

Table 4.26: One Way ANOVA for the differences in basic and advanced financial literacy based on investment Experience

Investment Experience		N	Mean	Std. Deviation	F	Sig.
Basic_Financial_Literacy	No experience	70	1.46	.912	11.542	.000
	1 to 5 years' experience	81	1.99	.955		
	More than 5 yrs experience	93	2.14	.904		
	Total	244	1.89	.963		
Advanced_Financial_Literacy	No experience	70	3.36	2.214	33.015	.000
	1 to 5 yrs experience	81	5.72	2.069		
	More than 5 yrs experience	93	5.82	2.037		
	Total	244	5.08	2.360		

4.3.9 Investment Instrument, Basic and Advanced Financial Literacy

H: There are significant differences in financial literacy, basic financial literacy and advanced financial literacy based on the investment instruments in which an investor has experience

The financial literacy was significantly different among the investment instruments as determined by the One-Way ANOVA (F (6,204) = 3.249, p=0.005). The Tukey Post Hoc test revealed that the respondents invest in equity/equity mutual funds have significant higher financial literacy (9.59±1.77) than the respondents who have only invested in current account or deposit accounts (6.46±2.858, p=0.001). There were no significant differences in respondent's financial literacy score of investors who have investing experience in other financial instruments. The basic financial literacy was not significantly different among the investors who have invested in different financial instruments according to the one-way ANOVA (F (6,204) =1.966, p=0.072).

The advanced financial literacy was significantly different among the investors who have invested in different financial instruments according to the one-way ANOVA (F (6,204) = 3.523, 0.002). The Tukey Post Hoc test revealed that the respondents who have invested in equity/equity mutual funds have significant higher advanced financial literacy (7.12±1.054) than the respondents who have only invested in current account or deposit accounts (4.60±2.313, p=0.000). There were no significant differences in respondent's advanced financial literacy score of investors who have investing experience in other financial instruments.

Table 4.27: One Way ANOVA for the differences in basic and advanced financial literacy based on Investment instrument

ANOVA

Investment Knowledge		N	Mean	Std. Deviation	F	Sig.
Financial Literacy	current account or deposit account	151	6.46	2.858	3.249	.005
	hedge funds or money market mutual funds	8	6.00	3.546		
	bonds and mutual funds investing primarily in bonds	17	7.06	2.680		
	mixed mutual funds	11	7.45	3.588		
	equities/equity mutual funds	17	9.59	1.770		
	exchange-traded derivatives	5	7.20	3.701		
	OTC derivatives	2	6.50	4.950		
	Total	211	6.82	2.966		
Basic_Financial_Literacy	current account or deposit account	151	1.87	.929	1.966	.072
	hedge funds or money market mutual funds	8	1.38	1.188		
	bonds and mutual funds investing primarily in bonds	17	1.82	1.015		
	mixed mutual funds	11	1.91	1.044		
	equities/equity mutual funds	17	2.47	.874		
	exchange-traded derivatives	5	1.40	1.140		
	OTC derivatives	2	1.00	1.414		
	Total	211	1.88	.968		
Advanced_Financial_Literacy	current account or deposit account	151	4.60	2.313	3.523	.002
	hedge funds or money market mutual funds	8	4.63	2.504		
	bonds and mutual funds investing primarily in bonds	17	5.24	2.223		
	mixed mutual funds	11	5.55	2.622		
	equities/equity mutual funds	17	7.12	1.054		
	exchange-traded derivatives	5	5.80	2.683		
	OTC derivatives	2	5.50	3.536		
	Total	211	4.94	2.353		

4.3.10 Association Between Gender, Financial Knowledge categories and Financial Literacy (H2b)

H: Male respondents perceived financial knowledge and actual financial literacy is significantly higher than females

The Cross tabulation and chi Square were calculated to see the relationship between different categories of financial knowledge, financial literacy and gender. The following table gives us details of the cross tabulation:

Table 4.28: Cross Tabulation results of Gender, Financial Knowledge and Financial Literacy

		Actual Financial Knowledge			Perceived Financial Knowledge			
		High Literacy	Low Literacy	Total	Little	Some	A Lot	Total
Gender	Male	98	15	113	14	69	30	113
	Female	76	55	131	40	84	7	131
Total		174	70	244	54	153	37	244

There was a significant association between gender and financial knowledge categories as $\chi 2 = 27.106$, $p<.001$ as well as financial literacy $\chi 2 = 24.444$, $p<.001$. According to the Phi value males have high Perceived Financial Knowledge as compared to females as well as actual financial knowledge/ financial literacy. The level of association of 0.317 and 0.333 respectively reflects strong relationship for the sample between gender, perceived and actual financial knowledge. This implies that male respondents were not only more confident about their financial knowledge than females but also their categorization according to financial literacy score showed that they had higher level of financial literacy than females.

Table 4.29: Percentages of perceived financial knowledge and financial literacy according to gender

Gender				
Financial Knowledge			Frequency	Percent
Little	High Literacy	Male	11	34
		Female	21	66
		Total	32	100

	Low Literacy	Male	3	14
		Female	19	86
		Total	22	100
Some	High Literacy	Male	59	55
		Female	49	45
		Total	108	100
	Low Literacy	Male	10	22
		Female	35	78
		Total	45	100
A Lot	High Literacy	Male	28	82
		Female	6	18
		Total	34	100
	Low Literacy	Male	2	67
		Female	1	33
		Total	3	100

4.3.11 Age and Perceived Financial Knowledge and Actual Financial literacy

H: there is significant association between financial knowledge and age groups

The Pearson chi square was calculated for testing the association of the perceived financial knowledge and different age categories. The chi square value was not significant as χ (8) = 9.126, p = .332. This tells us that there is no statistically significant association between different age groups and different levels of perceived financial knowledge.

Table 4.30: Pearson Chi Square Test

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9.126[a]	8	.332
Likelihood Ratio	11.496	8	.175
Linear-by-Linear Association	6.403	1	.011
N of Valid Cases	241		

a. 4 cells (26.7%) have expected count less than 5. The minimum expected count is 1.69.

H: There are significant differences in financial literacy among different age groups

The actual financial literacy was significantly different among different age groups as determined by the One-Way ANOVA (F (4,236) =3.069, p= 0.017. But the post hoc test calculations revealed that there were no significant differences in financial literacy among different age groups.

Table 4.31: One Way ANOVA for differences in financial literacy among age group groups

ANOVA

Financial Literacy

	N	Mean	Std. Deviation	F	Sig.
18-25	11	5.91	3.562	3.069	.017
26-34	35	6.46	2.726		
35-54	122	6.73	3.045		
55-64	51	7.67	2.754		
65 or Over	22	8.50	2.464		
Total	241	7.01	2.967		

4.3.12 Education Level and Perceived Financial Knowledge and Actual Financial literacy

H: There is a significant association between financial knowledge and education level of a respondent

The Pearson chi square calculation was found to be not significant as $\chi 2$ =16.82, p=0.535. Therefore, we accept the null hypothesis that there is no association between perceived financial knowledge and education level.

Table 4.32: Pearson Chi Square

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16.822[a]	18	.535
Likelihood Ratio	16.950	18	.527
Linear-by-Linear Association	2.331	1	.127
N of Valid Cases	244		

a. 16 cells (53.3%) have expected count less than 5. The minimum expected count is .15.

H: There is significant differences in financial literacy score based on education level

The financial literacy score was significantly different among the education levels as determined by the One-Way ANOVA (F (8,234) =2.587, p=0.01. The Tukey post hoc test showed that the financial literacy score differed among the respondents with some high school no diploma (4.8±2.757) and master's degree (7.85± 2.59, p=0.036) respondents. The other education level respondents did not show significant differences in financial literacy score.

Table 4.33: One-Way ANOVA for differences in financial literacy score based on education

Education	N	Mean	Std. Deviation	F	Sig.
Some high school, no diploma	15	4.80	2.757	2.478	.013
High school graduate, diploma or the equivalent (for example: GED)	24	6.00	3.203		
Some college credit, no degree	20	5.95	3.170		
Trade/technical/vocational training	23	7.09	3.204		
Associate degree	8	6.88	3.044		
Bachelor's degree	81	7.44	2.766		
Master's degree	46	7.85	2.590		
Professional degree	19	6.79	3.137		
Doctorate degree	7	7.14	3.625		
Total	243	6.98	2.990		

4.3.13 Association between financial literacy categories, perceived financial knowledge and investment experience

H: There is significant association between perceived financial knowledge, actual financial literacy and investment experience

In order to test the hypothesis Pearson Chi Square test was done for both financial literacy and perceived financial knowledge categories.

There was a significant association between investment experience and financial knowledge categories as $\chi 2 = 31.816$, p=0.000 as well as financial literacy $\chi 2 = 31.576$,

p=.001. According to the Phi value higher the investment experience higher the Perceived Financial Knowledge as well as higher the investment experience higher the actual financial knowledge/ financial literacy. The level of association of 0.36 and 0.361 respectively reflects strong relationship for the sample between investment experience, perceived and actual financial knowledge. This implies that more experienced investors were not only more confident about their financial knowledge than less experienced ones but also their categorization according to their financial literacy showed that they had higher level of financial literacy.

Table 4.34: Cross Tabulation and Pearson Chi Square

Count

		Financial literacy			financial knowledge			
		Low Literacy	High Literacy	Total	Little	Some	A Lot	Total
Investment Experience	No experience	38	32	70	31	36	3	70
	1 to 5 yrs experience	16	65	81	9	56	16	81
	More than 5 yrs experience	16	77	93	14	61	18	93
Total		69	174	244	53	153	37	244

Chi-Square Tests

Financial Literacy	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	31.576[a]	2	.000
Likelihood Ratio	30.050	2	.000
Linear-by-Linear Association	24.755	1	.000
N of Valid Cases	244		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 20.08.

Chi-Square Tests

Financial Knowledge	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	31.816[a]	4	.000
Likelihood Ratio	31.630	4	.000
Linear-by-Linear Association	18.994	1	.000
N of Valid Cases	244		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.61.

4.3.14 Personality Traits, Decision Making Styles and Financial Literacy (Basic and Advanced) H3a

H3a: Personality Traits, basic and advance Financial Literacy are significantly related

The Pearson correlation calculation showed (See *Table 4.10: Relationship among the Variables calculated using Pearson Correlations*) that financial literacy had a weak negative relationship with neuroticism (r= -237, n=244, p<0.001), a very weak positive relationship with conscientiousness (r=0.14, n=244, p<0.05) and openness to experience (r=0.19, n=244, p<0.001). Basic financial literacy had only a weak negative relationship with neuroticism (r= -0.26, n=244, p<0.001) but not with other personality traits. Advanced financial literacy had a very weak negative relationship with neuroticism (r= -0.20, n=244, p<0.001) and a very weak positive relationship with openness to experience (r= 0.20, n=244, p<0.001). Financial knowledge had a weak significant positive relationship with extraversion (r=0.23, n=244, p<0.001), conscientiousness (r=0.21, n=244, p<0.001) and openness to experience (r=0.24, n=244, p<0.001). While a weak negative relationship with neuroticism (r= -23, n=244, p<0.001).

H: There is a significant relationship between decision making styles, basic and advanced financial literacy

Intuition had a very weak negative relationship with financial literacy (r= -0.17, n=244, p<0.001), basic financial literacy (r= -0.20, n=244, p<0.001) and advanced financial literacy (r= -0.14, n=244, p<0.05). Spontaneous decision-making style had a very weak negative relationship with basic financial literacy (r= -0.14, n=244, p<0.05) and very weak positive relationship (r=0.20, n=244, p<0.001) with card selection from deck B (advantageous deck). Vigilance had a very weak positive relationship with financial literacy (r=0.16, n=244, p<0.05), basic financial literacy (r=0.16, n=244, p<0.05) and advanced financial literacy (r=0.14, n=244, p<0.05).

4.3.15 Personality Traits, Decision Making Styles and Financial Literacy H3b

H: There are significant differences in personality traits based on perceived financial knowledge

The One-way ANOVA calculation showed that there are significant differences in personality traits on the basis of perceived financial knowledge except for agreeableness trait.

The extraversion trait was significantly different among the perceived financial knowledge as determined by the One-Way ANOVA (F (2,242) = 6.772, p=0.001). The Tukey Post Hoc test revealed that the respondents with little perceived financial knowledge were low on extraversion (2.78±0.852) than the respondents with some (3.07±0.761, p<0.05) and the respondents with a lot of perceived financial knowledge (3.38±0.636, p=0.001).

H: There are significant differences in decision making styles based on the perceived financial literacy level

The decision-making styles were not found to be significantly different among the perceived financial knowledge levels as determined by the One-Way ANOVA for intuitive decision style (F (2,242) = 0.004, p=0.996), spontaneous decision style (F (2,242) = 0.105, p=0.901) and vigilance decision style (F (2,242) =0.351, p=0.704).

Table 4.35: One Way ANOVA

		N	Mean	Std. Deviation	F	Sig.
Intuition	Little	54	3.26	.648	.004	.996
	Some	153	3.27	.757		
	A Lot	37	3.25	.668		
	Total	244	3.26	.718		
Spontaneous	Little	54	2.77	.958	.105	.901
	Some	153	2.75	.866		
	A Lot	37	2.69	.727		
	Total	244	2.75	.865		
Vigilance	Little	54	4.01	.565	.351	.704
	Some	153	3.99	.572		

A Lot	37	4.08	.623
Total	244	4.01	.577

4.3.16 Demographics and Iowa Gambling Task Performance (H4a)

H: Demographic variables (age, gender) are related to the Iowa gambling task performance

The independent t-test was calculated for differences in net score of Iowa gambling task and gender which was found not to be significant t (242) = 0.168, p>0.05. No significant differences were found to be present for age, ethnicity, education and financial knowledge.

Table 4.36: Independent Sample T-test for Gender differences in Iowa gambling task Score

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
IGT Score	Equal variances assumed	.054	.817	.168	242	.867
	Equal variances not assumed			.167	231.899	.867

4.3.17 Performance of respondents over the five blocks

H: The respondents learned to make advantageous decisions over the five blocks of the Iowa gambling task

The repeated measure ANOVA was calculated for comparing the performance between blocks to identify learning effects. The Mauchly's test indicated that the assumption of sphericity had been violated as, $\chi 2$ (5) =89.492, p=.000, therefore the Greenhouse-Geisser estimates of sphericity were used to correct this assumption not being met. The results show that there is a significant difference in the performance among blocks of 20 trials, F (3.305, 89.492) =13.250, p=0.000. These results show that the performance of the participants in

terms of selecting from the advantageous decks as compared to the disadvantageous decks improved over the 20,40, 60, 80 and 100 trials showing a learning effect.

Table 4.37: Repeated Measures ANOVA for the learning effect of Participants

	df	Mean Square		F	Sig.	Partial Eta Squared
Blocks	4	688.669		13.250	.000	.052

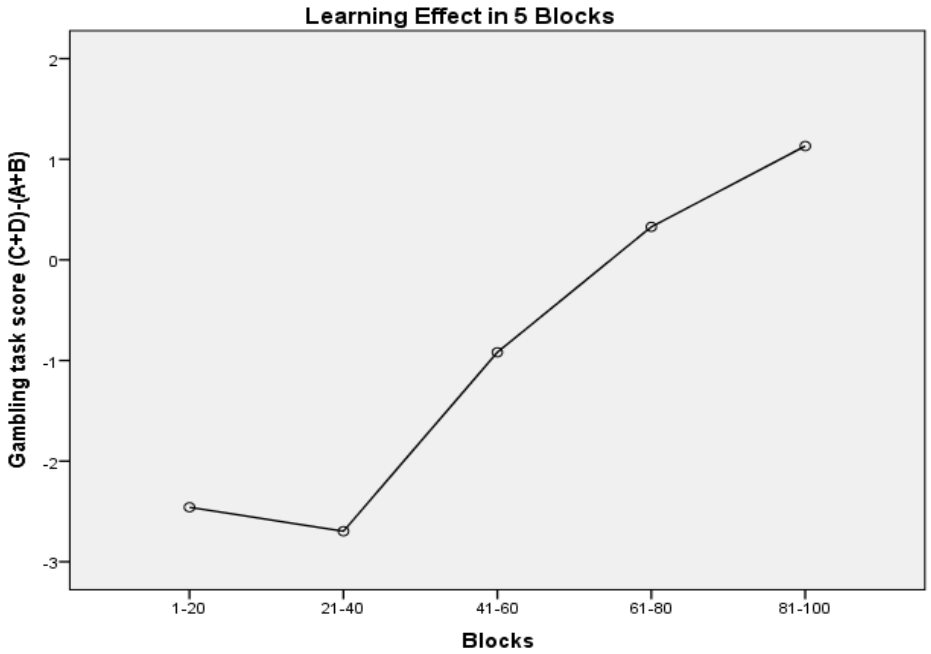

Figure 4.5. The performance of the respondents displayed across five blocks based on score calculated after 20, 40, 60,80 and 100 trials of the Iowa gambling task

4.3.18 Personality traits and differences in card selection and IGT Score (H4b)

H: Personality traits are significantly related to Iowa gambling task performance

There were no significant differences among the personality traits and card selection from decks A, B, C and D apart from conscientiousness Vs undirectedness. The one-way ANOVA calculation showed (F (1,242) =6.824, p=0.10) that individuals who are high on conscientiousness (21.81±13.462) choose more from deck A as compared to the ones who are high on undirectedness (15.80±12.507). The deck C selection also differed among the personality trait conscientiousness as one Way ANOVA (F (1, 242) =5.287, 0.022) and the individuals with high undirectedness (18.775±17.05) choose more from deck C as

compared to the individuals high on conscientiousness (13.32±12.97). Therefore, the respondents who have conscientiousness personality trait tend to choose more the disadvantageous deck A and deck C advantageous deck.

Table 4.38: One Way ANOVA for Card Selection differences based on Conscientiousness Vs Undirectedness

		N	Mean	Std. Deviation	F	Sig.
A	undirectedness	40	15.80	12.507	6.824	.010
	Conscientiousness	204	21.81	13.462		
	Total	244	20.83	13.472		
B	undirectedness	40	9.4000	8.16120	.031	.861
	Conscientiousness	204	9.1569	8.00646		
	Total	244	9.1967	8.01556		
C	undirectedness	40	18.7750	17.05119	5.287	.022
	Conscientiousness	204	13.3235	12.97034		
	Total	244	14.2172	13.83077		
D	undirectedness	40	16.0250	12.73092	.027	.870
	Conscientiousness	204	15.7059	10.96082		
	Total	244	15.7582	11.24232		

The One-Way ANOVA was also calculated for the differences in Iowa gambling task net score ((C+D) -(A+B)) which showed significant differences in scores of the conscientiousness vs undirectedness (F (1,242) = 5.534, p=0.019). The individuals who were high in undirectedness (9.6±27.95) performed better as compared to the more conscientiousness individuals (-1.94±28.45).

Table 4.39: One Way ANOVA calculation for differences in IGT Score based on differences in Conscientiousness personality trait

	N	Mean	Std. Deviation	F	Sig.
undirectedness	40	9.6000	27.95307	5.534	.019
Conscientiousness	204	-1.9412	28.45092		
Total	244	-.0492	28.63474		

4.3.19 Investment Experience and Iowa gambling Task Performance (H5)

H7: The individuals with more years of Investment experience will performance better on the Iowa gambling task as compared to the less experienced investors

4.3.19.1 Comparisons of card selection on the basis of Investment Experience and Financial Knowledge

The one-way ANOVA for the A, B, C, and D decks with investment experience and financial knowledge as factor were calculated for the 100 trials as well as the last 60 trials. There were no significant differences in card selection from different decks based on gender, investment experience, financial risk tolerance and financial knowledge over the 100 trials. But the last 60 trials showed some differences based on card selection.

On the other hand, deck C significantly differed in being selected by investors having more than five years of experience and non-investors. Deck C is one of the advantageous decks and it can be concluded that the more experienced investors select more (17.31±17.41, p=0.21) as compared to non-investors (11.34±10.41).

Table 4.40: ANOVA for comparing mean number of cards from each deck based on investment experience

Deck of Cards	Investment Experience	N	Mean	F	Sig.
A	No experience	70	22.54	.851	.428
	1 to 5 years' experience	81	20.51		
	More than 5 years' experience	93	19.82		
	Total	244	20.83		
B	No experience	70	8.9000	2.241	.109
	1 to 5 years' experience	81	10.6667		
	More than 5 years' experience	93	8.1398		
	Total	244	9.1967		
C	No experience	70	11.3429	4.189	.016
	1 to 5 years' experience	81	13.1481		
	More than 5 years' experience	93	17.3118		
	Total	244	14.2172		
D	No experience	70	17.2143	.977	.378
	1 to 5 yrs experience	81	15.6790		
	More than 5 yrs experience	93	14.7312		
	Total	244	15.7582		

4.3.19.2 Risk Preference Vs Risk Aversion Over the 5 blocks and Investment Experience

In order to further explore the changes in risk preference and risk aversion over the 5 blocks the two-way mixed ANOVA with between subject factor gender, financial risk tolerance, investment experience and financial knowledge were calculated. The interactions between Blocks, Blocks*Risk, Blocks * Investment Experience and Blocks*Risk*Investment Experience was found to be significant ($p<0.05$) so we can conclude that through the blocks the participants learn to choose from the advantageous decks thus becoming more risk averse and choose less from the disadvantageous decks indicating their decline in risk preference. The finding is also significant that investment experience does have a main effect as $p<0.05$ on the overall learning (Blocks) and risk attitude mentioned here as risk preference and risk aversion.

Table 4.41: Interactions and Main effect for Blocks Risk Perception Vs Risk Aversion and Investment Experience*

	df	Mean Square	F	Sig.	Partial Eta Squared
Blocks	1.000	28.772	128.151	.000	.381
Blocks* Risk attitude	3.304	312.570	9.998	.000	.046
Blocks * Risk attitude* Investment Experience	6.609	87.757	2.807	.008	.026
Blocks*Investment Experience	2.000	.876	3.903	.022	.036
Main effect of Investment Experience	2	.219	3.903	.022	.036

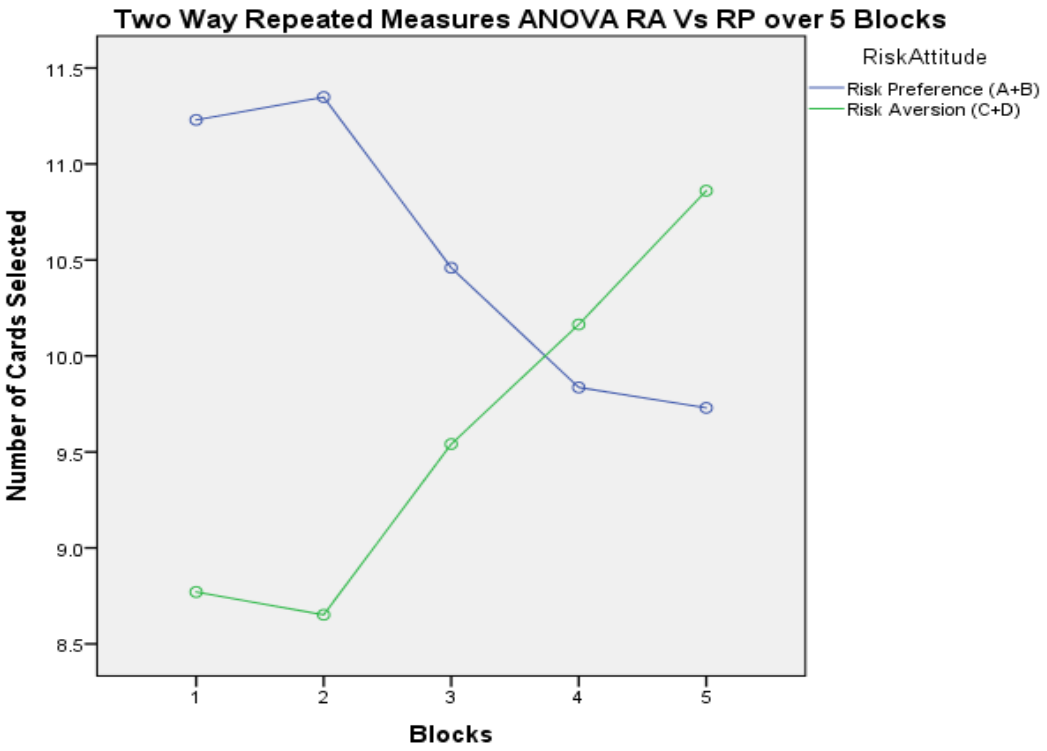

Figure 4.6: Two Way Mixed Factor ANOVA Risk Preference Vs Risk Aversion over the 5 Blocks

4.3.19.3 Investment Experience and performance over the final blocks

A mixed factor ANOVA did not find main effect of investment experience (F (1, 208) = 1.210, P>.05). There was no interaction between investment experience and performance in the Iowa gambling task (F (4, 50.455) =1.284, p>0.05). Thus, it can be concluded that the performance in the task is not affected by having any level of investment experience.

Table 4.42: Statistics for the Mixed Measures Factorial ANOVA

	df	Mean Square	F	Sig.	Partial Eta Squared
Blocks* Investment Experience interaction	4.00	50.46	1.28	0.28	0.01
Main effect of Investment Experience	2.00	335.76	1.21	0.30	0.01
Blocks * financial knowledge	3.85	59.42	1.48	0.21	0.01
Main effect of financial knowledge	2.00	324.33	1.17	0.31	0.01

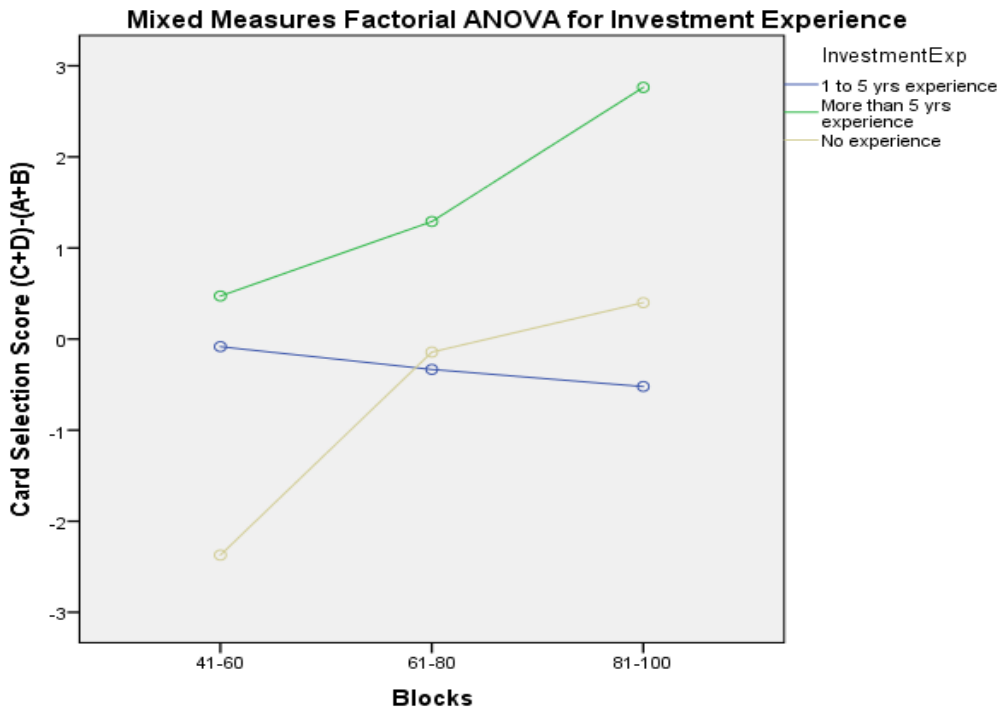

Figure 4.7: Mixed Measures Factorial ANOVA for Investment Experience

H: The individuals with more financial knowledge will perform better on the Iowa gambling task

All other decks apart from deck B did not show any significant differences in selection based on perceived financial knowledge. Deck B is the disadvantageous deck and It was identified in the results that selection of cards from deck B significantly differed based on financial knowledge. The mean number of cards selected being (M(little)= 6.29, M(Some) = 10.05 and M (a lot) = 9.89).

Table 4.43: ANOVA for comparing mean number of card selections from each deck based on financial knowledge

Deck of Cards	Financial Knowledge	N	Mean	F	Sig.
A	Little	54	21.70	.577	.562
	Some	153	21.03		
	A Lot	37	18.73		
	Total	244	20.83		
B	Little	54	6.2963	4.687	.010
	Some	153	10.0588		
	A Lot	37	9.8649		
	Total	244	9.1967		
C	Little	54	14.2778	1.175	.311

	Some	153	13.4444		
	A Lot	37	17.3243		
	Total	244	14.2172		
D	Little	54	17.7222	1.289	.277
	Some	153	15.4706		
	A Lot	37	14.0811		
	Total	244	15.7582		

The mixed ANOVA did not find main effect of financial knowledge (F (1, 208) = 1.48, P>.05). There was no interaction between financial knowledge and performance in the Iowa gambling task (F (4, 59.42) =1.17, p>0.05). Thus, it can be concluded that the performance in the task is not affected by having any level of financial knowledge.

4.3.20 Personality Traits and Investment Experience (H6)

H8: Personality traits differ based on the investment experience a respondent has

The One-Way ANOVA calculation showed significant differences in personality traits of neuroticism, conscientiousness and openness to experience according to investment experience level as (F (2,241) =3.872, p=0.022), (F (2,241) =6.977, p=0.001) and (F (1,241) =4.145, p=0.017) respectively. The Tukey post hoc tests showed that there were significant differences among the individuals who had no investment experience (2.94±0.717) were high on neuroticism as compared to the investors with more than five years of investing experience (2.66±0.732, p= 0.029). The Tukey post hoc tests showed that there were significant differences among the individuals who had no investment experience (3.6±0.615, p=0.003) and investors with 1-5 years of investing experience (3.66±0.632, p=0.009) were low on conscientiousness compared to the investors with more than five years of investing experience (3.94±0.637). The Tukey post hoc tests showed that there were significant differences among the individuals who had no investment experience (3.30±0.579) were low on Openness to experience as compared to the investors with more than five years of investing experience (3.55±0.609, p= 0.017).

Table 4.44:Personality trait differences among respondents based on investment experience

		N	Mean	Std. Deviation	F	Sig.
Extraversion	No experience	70	2.89	.815	2.314	.101
	1 to 5 yrs experience	81	3.12	.757		
	More than 5 yrs experience	93	3.12	.770		
	Total	244	3.05	.783		
Agreeableness	No experience	70	3.61	.463	.094	.911
	1 to 5 yrs experience	81	3.60	.480		
	More than 5 yrs experience	93	3.63	.500		
	Total	244	3.62	.481		
Neuroticism	No experience	70	2.94	.717	3.872	.022
	1 to 5 yrs experience	81	2.68	.651		
	More than 5 yrs experience	93	2.66	.732		
	Total	244	2.75	.710		
Conscientiousness	No experience	70	3.60	.615	6.977	.001
	1 to 5 yrs experience	81	3.66	.632		
	More than 5 yrs experience	93	3.94	.637		
	Total	244	3.75	.644		
Openness	No experience	70	3.30	.579	4.145	.017
	1 to 5 yrs experience	81	3.38	.535		
	More than 5 yrs experience	93	3.55	.609		
	Total	244	3.43	.584		

4.3.21 Demographics and Balloon Analogue Risk Task (H7)

H9: The number of explosions and average number of pump count significantly differ among the demographic variables (gender, age, ethnicity, education)

4.3.21.1 Gender and Balloon Analogue Risk Task

There was no significant difference based on gender in mean number of explosions and average number of pump counts as t (242) = 0.446, p>0.05 and t (242) =0.069, p>0.05. Therefore, it can be concluded that both genders did not differ in risky taking behavior in BART.

Table 4.45: Independent Samples T-Test for gender differences in BART

Gender		N	Mean	Std. Deviation	Std. Error Mean
Explosions	Male	113	5.18	3.80	0.36
	Female	131	4.98	3.21	0.28
Avg_PumpCount	Male	113	19.93	14.41	1.36
	Female	131	19.82	12.33	1.08

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Explosions	Equal variances assumed	2.302	.131	.446	242	.656
	Equal variances not assumed			.440	220.219	.660
Avg_PumpCount	Equal variances assumed	.914	.340	.069	242	.945
	Equal variances not assumed			.069	221.924	.945

4.3.21.2 Employment Status and Balloon Analogue Risk Task

The calculation of One Way ANOVA showed that there were significant differences in the number of explosions on the basis of employment status (F (7,236) =3.007, p=0.005). The Tukey Post Hoc test revealed that the respondents who were students had the higher mean number of explosions (7.76±4.37) as compared to the respondents who were retired (4.12±2.94, p=0.005) and employed for wages (4.78±3.27, p=0.004).

The average number of pump counts was significantly different among the employment status as determined by the One-Way ANOVA (F (7,236) =2.525, p= 0.016). The Tukey Post Hoc test revealed that the respondents who were students had the higher average number of pump counts (30.12±18.77) as compared to the respondents who were retired (17.53±11.98, p=0.015) and employed for wages (18.54±12.59, p=0.004). There were no significant differences in average number of pump count based on other employment status.

Table 4.46: ANOVA for differences in explosions and average pump count of the respondents based on different employment Status groups

Employment Status		N	Mean	Std. Deviation	F	Sig.
Explosions	Employed for wages	141	4.7801	3.26692	3.007	.005
	Self-employed	26	5.0769	3.57685		
	Out of work and looking for work	5	6.4000	3.50714		
	Out of work but not currently looking for work	3	8.6667	4.72582		
	A homemaker	10	4.8000	3.29309		
	A student	21	7.7619	4.36926		
	Retired	33	4.1212	2.94489		
	Unable to work	5	5.2000	3.56371		
	Total	244	5.0697	3.48885		
Avg_PumpCount	Employed for wages	141	18.5363	12.59080	2.525	.016
	Self-employed	26	20.3888	12.21530		
	Out of work and looking for work	5	25.0740	13.71215		
	Out of work but not currently looking for work	3	26.2533	16.58285		
	A homemaker	10	21.0510	9.48396		
	A student	21	30.1186	18.77417		
	Retired	33	17.5339	11.97613		
	Unable to work	5	15.8140	9.31438		
	Total	244	19.8711	13.30543		

4.3.21.3 Age and Balloon Analogue Risk Task

The calculation of One Way ANOVA showed that there are no significant differences in the number of explosions on the basis of age (F (4,236) =1.663, p=0.159).

The average number of pump counts was significantly different among the different age groups as determined by the One-Way ANOVA (F (4,236) =2.805, p= 0.026). The Tukey Post Hoc test revealed that the respondents of age group 26-34 had higher average pump count (25.14±17.87) than the age group 65 or over (14.18±10.76, p=0.021). There were no significant differences in the average pump counts of the other age groups.

Table 4.47: ANOVA for differences in explosions and average pump count of the respondents based on different age groups

Age		N	Mean	Std. Deviation	F	Sig.
Explosions	18-25	11	6.4545	4.13192	1.663	.159
	26-34	35	5.9429	4.53706		
	35-54	122	5.0328	3.09073		
	55-64	51	4.5882	3.40104		
	65 or Over	22	4.0909	3.51743		
	Total	241	5.0498	3.50321		
Avg_PumpCount	18-25	11	24.1164	15.30720	2.805	.026
	26-34	35	25.1437	17.86616		
	35-54	122	19.2991	12.26891		
	55-64	51	19.1288	12.00075		
	65 or Over	22	14.1809	10.76499		
	Total	241	19.8645	13.38464		

4.3.21.4 Ethnicity and Balloon Analogue Risk Task

The calculation of One Way ANOVA showed that there are significant differences in the number of explosions on the basis of ethnicity (F (5,238) =3.936, p=0.002). The Tukey Post Hoc test revealed that the respondents who were Middle eastern/ Arab had the higher mean number of explosions (12.0±6.56) as compared to the respondents who were White (Irish, European, traveller, Gypsy) (3.89±3.3, p=0.005) and White British (4.82±3.24, p=0.004). There were no significant differences in mean number of explosions on the basis of any other ethnicity.

The average number of pump counts was significantly different among the ethnicity groups as determined by the One-Way ANOVA (F (5,238) =3.43, p= 0.005). The Tukey Post Hoc test revealed that the respondents who were Middle eastern/ Arab had the higher average number of pump counts (46.74±30.97) as compared to the respondents who were White (Irish, European, traveller, Gypsy) (17.08±11.65, p=0.009) and White British (18.99±12.2,

p=0.004). There were no significant differences in average number of pump counts on the basis of any other racial group.

Table 4.48: ANOVA for differences in explosions and average pump count of the respondents based on different Ethnicity's

ANOVA

Ethnicity		N	Mean	Std. Deviation	F	Sig.
Explosions	White British (English/Welsh/Scottish/Northern Irish/British)	201	4.82	3.24	3.936	.002
	White (Irish, European, traveller, Gypsy)	9	3.89	3.30		
	Black (Black British, African, Caribbean)	6	7.17	4.62		
	Asian (Asian British, Indian, Pakistani, Bangladeshi, Chinese, Japanese)	18	6.06	4.35		
	Middle Eastern/Arab	3	12.00	6.56		
	Mixed/Multiple heritage	7	6.43	2.37		
	Total	244	5.07	3.49		
Avg_PumpCount	White British (English/Welsh/Scottish/Northern Irish/British)	201	18.99	12.20	3.432	.005
	White (Irish, European, traveller, Gypsy)	9	17.08	11.65		
	Black (Black British, African, Caribbean)	6	25.60	18.05		
	Asian (Asian British, Indian, Pakistani, Bangladeshi, Chinese, Japanese)	18	23.65	17.32		
	Middle Eastern/Arab	3	46.74	30.97		
	Mixed/Multiple heritage	7	22.53	10.12		
	Total	244	19.87	13.31		

4.3.22 Investor and Student Differences in Iowa gambling task Performance (H8)

There was no significant difference in card selection from the Iowa gambling task decks of students and investors. Therefore, it can be concluded that both students and investors both did not differ in their performance on the Iowa gambling task.

Table 4.49:One Way ANOVA for differences in card selection based on Students and Investors

One Way ANOVA

		N	Mean	Std. Deviation	F	Sig.
A	Finance Student	32	21.97	14.452	.424	.655
	Investor	80	21.48	13.203		
	Other (Broker, Accountants)	131	20.05	13.444		
	Total	243	20.77	13.469		
B	Finance Student	32	9.6563	9.31738	1.039	.355
	Investor	80	10.1625	7.47052		
	Other	131	8.5649	7.98759		
	Total	243	9.2346	8.01023		
C	Finance Student	32	13.2813	15.19812	.094	.910
	Investor	80	14.3875	13.50152		
	Other	131	14.4427	13.78693		
	Total	243	14.2716	13.83314		
D	Finance Student	32	15.0938	12.35590	1.801	.167
	Investor	80	13.9750	9.67441		
	Other	131	16.9466	11.78807		
	Total	243	15.7243	11.25301		

The agreeableness trait was not found to be significantly different among the perceived financial knowledge levels as determined by the One-Way ANOVA (F (2,242) = 0.166, p=0.847).

The neuroticism trait was found to be significantly different among the perceived financial knowledge levels as determined by the One-Way ANOVA (F (2,242) = 6.558, p=0.002). The Tukey Post Hoc test revealed that the respondents with a lot perceived financial knowledge were low on neuroticism (2.44±0.601) as compared to the respondents with little (2.97±0.757, p=0.001) and some perceived financial knowledge (2.74±0.692, p=0.042).

The conscientiousness and openness to experience traits were found to be significantly different among the perceived financial knowledge levels as determined by the One-Way ANOVA (F (2,242) =5.78, p=0.004) and (F (2,242) =7.182, p=0.001) respectively. The Tukey Post Hoc test revealed that the respondents with little perceived financial knowledge

were low on conscientiousness (3.51±0.660) than the respondents with some (3.79±0.624, p=0.013) and the respondents with a lot of perceived financial knowledge (3.92±0.621, p=0.06). The Tukey Post Hoc test revealed that the respondents with little perceived financial knowledge were low on openness to experience (3.22±0.610) than the respondents with some (3.44±00.554, p<0.05) and the respondents with a lot of perceived financial knowledge (3.68±0.576, p=0.001).

Table 4.50: One Way ANOVA for differences in personality traits based on perceived financial knowledge levels

		N	Mean	Std. Deviation	F	Sig.
Extraversion	Little	54	2.78	.852	6.772	.001
	Some	153	3.07	.761		
	A Lot	37	3.38	.636		
	Total	244	3.05	.783		
Agreeableness	Little	54	3.65	.463	.166	.847
	Some	153	3.60	.465		
	A Lot	37	3.61	.575		
	Total	244	3.62	.481		
Neuroticism	Little	54	2.97	.757	6.558	.002
	Some	153	2.74	.692		
	A Lot	37	2.44	.601		
	Total	244	2.75	.710		
Conscientiousness	Little	54	3.51	.660	5.779	.004
	Some	153	3.79	.624		
	A Lot	37	3.92	.621		
	Total	244	3.75	.644		
Openness	Little	54	3.22	.610	7.182	.001
	Some	153	3.44	.554		
	A Lot	37	3.68	.576		
	Total	244	3.43	.584		

4.3.23 Demographics and Personality Traits

H: There are significant differences in personality traits based on gender and age

One Way ANOVA was calculated to that how personality traits differ for different genders and age groups. The only personality trait affected by the gender and age neuroticism. The neuroticism personality trait does get effected by age according to the One-Way ANOVA (F (4,236) =3.159, p=0.015). The Tukey Post Hoc test revealed that there were significant differences in age groups 26-34 (3.05±0.724) score higher on the neuroticism trait as compared to the 65 or over age group (2.41±0.493, p=0.009). Thus, the younger respondents are less emotionally stable than the 65 or over and therefore tend to be more impulsive, tense, shy, and vulnerable.

The neuroticism personality trait does get effected by gender according to the One-Way ANOVA (F (1,239) =12.997, p=0.000). The females (2.9±0.734) were significantly higher in possessing neuroticism trait attributes as compared to the males (2.58±0.651). Thus, the female respondents are less emotionally stable than males and therefore tend to be more impulsive, tense, shy, and vulnerable.

4.4 Statistical Analysis and Findings for the hypotheses for RQ2

4.4.1 Relationship between Financial Risk Tolerance and Financial literacy (Basic and Advanced) H1

H1: There are significant differences in basic and advanced financial literacy based on financial risk categories

The one-way ANOVA was calculated for both categories high and low and the five risk tolerance categories in order to identify differences in basic and advanced financial literacy.

The basic financial literacy was significantly different among the high and low financial risk tolerance respondents as determined by the One-Way ANOVA (F (1,242) = 4.450, p=0.036). The high risk tolerant individuals had higher basic financial literacy (2.05±0.96)

as compared to the low risk tolerant ones (1.79±0.96). The advanced financial literacy also differed among both the groups according to the one-way ANOVA (F (1,242) =29.148, p=0.000). The high risk tolerant individuals had higher advanced financial literacy (6.02±1.98) as compared to the low risk tolerant ones (4.45±2.39).

Table 4.51: One Way ANOVA for the differences in basic and advanced financial literacy based on high and low financial risk tolerance

		N	Mean	Std. Deviation	F	Sig.
Basic_Financial_Literacy	Low Risk tolerance	146	1.7877	0.9556	4.450	.036
	High Risk Tolerance	98	2.0510	0.9565		
	Total	244	1.8934	0.9627		
Advanced_Financial_Literacy	Low Risk tolerance	146	4.4452	2.3897	29.148	.000
	High Risk Tolerance	98	6.0204	1.9792		
	Total	244	5.0779	2.3601		

The basic financial literacy was significantly different among the financial risk tolerance categories as determined by the One-Way ANOVA (F (4,236) = 2.558, p=0.039). But the Tukey Post Hoc test did not show any significant differences among the groups.

The advanced financial literacy was significantly different among financial risk tolerance categories as below average risk tolerance respondents determined by the One-Way ANOVA (F (4,236) = 11.209, 0.000). The Tukey Post Hoc test revealed that the respondents with below-average risk tolerance had lower advance financial literacy (3.67±2.25) than the respondents with Average/moderate risk tolerance (5.35±2.35, p=0.000), Above average risk tolerance (5.94±1.64, p=0.000) and the respondents with High risk tolerance (6.48±1.99, p=0.000) (See Table 4.52: One Way ANOVA for the differences in basic and advanced financial literacy based on Financial Risk Tolerance Categories).

Table 4.52: One Way ANOVA for the differences in basic and advanced financial literacy based on Financial Risk Tolerance Categories

		N	Mean	Std. Deviation	F	Sig.
Basic_Financial_Literacy	Low risk tolerance	15	1.73	.594	2.558	.039
	Below-average risk tolerance	64	1.59	1.003		
	Average/moderate risk tolerance	96	1.99	.946		
	Above-average risk tolerance	48	2.06	.976		
	High risk tolerance	21	2.10	.944		
	Total	244	1.89	.963		
Advanced_Financial_Literacy	Low risk tolerance	15	4.60	2.501	11.209	.000
	Below-average risk tolerance	64	3.67	2.254		
	Average/moderate risk tolerance	96	5.35	2.353		
	Above-average risk tolerance	48	5.94	1.643		
	High risk tolerance	21	6.48	1.990		
	Total	244	5.08	2.360		

4.4.2 Relationship between Financial Risk Tolerance, Actual Financial literacy and Perceived Financial Knowledge (H2, H3)

H2: There are significant differences in financial literacy based on financial risk tolerance categories

There were significant differences in financial literacy based on the financial risk tolerance categories according to the One-Way ANOVA (F (4,239) =9,982, p<0.001). The Tukey Post Hoc test revealed that the respondents with below average risk tolerance had lower financial literacy score (5.27±2.83) as compared to the average risk tolerance (7.34±2.98, p=0.001) above average risk tolerance (8.00±2.33, p<0.001) and high risk tolerance individuals (8.57±2.75, p<0.001). Therefore, it can be said that respondents who had significantly higher financial literacy had higher financially risk tolerance also.

Table 4.53: One Way ANOVA for the differences in financial literacy based on Financial Risk Tolerance Categories

		N	Mean	Std. Deviation	F	Sig.
Financial Literacy Score	Low risk tolerance	15	6.33	2.690	9.982	.000
	Below-average risk tolerance	64	5.27	2.830		
	Average/moderate risk tolerance	96	7.34	2.980		
	Above-average risk tolerance	48	8.00	2.334		
	High risk tolerance	21	8.57	2.749		
	Total	244	6.97	2.986		

There were significant differences in financial risk score based on the perceived financial knowledge according to the One-Way ANOVA (F (2,241) =9.864, p<0.001). The Tukey Post Hoc test revealed that the respondents with little perceived financial knowledge had lower financial risk tolerance score (23.11±3.745) as compared to the some (25.95±5.07, p=0.001) and a lot (27.32±5.24, p<0.001) levels of perceived financial knowledge. Thus, the higher the level of confidence of an individual about his/her financial knowledge the individual is more likely to be having a higher financial risk tolerance and willing to take risks.

H: There are significant differences in financial risk score and financial literacy score based on perceived financial knowledge

There were significant differences in financial literacy score based on the perceived financial knowledge according to the One-Way ANOVA (F (2,241) =10.513, p<0.001). The Tukey Post Hoc test revealed that the respondents with little perceived financial knowledge had lower financial literacy score (5.76±3.071) as compared to the some (7.01±2.807, p=0.017) and a lot (8.57±2.86, p<0.001) levels of perceived financial knowledge.

Table 4.54: One Way ANOVA for the differences in financial risk score and financial literacy based on Perceived Financial Knowledge

ANOVA

		N	Mean	Std. Deviation	F	Sig.
Financial Risk Score	Little	54	23.11	3.745	9.864	.000
	Some	153	25.95	5.070		
	A Lot	37	27.32	5.244		
	Total	244	25.53	5.011		
Financial Literacy Score	Little	54	5.76	3.071	10.513	.000
	Some	153	7.01	2.807		
	A Lot	37	8.57	2.863		
	Total	244	6.97	2.986		

One-way ANOVA was calculated to evaluate that did financial risk tolerance score significantly differ among respondents with different level of financial knowledge. There was a statistically significant difference among the financial risk scores as ($F(2, 241) = 9.864$, $p<0.001$). The Tukey post hoc test shows that the financial risk tolerance score is statistically different among some financial knowledge (25.95 ± 5.070, $p=0.001$) and a lot financial knowledge (27.32 ± 5.244, $p<0.000$) as compared to little financial knowledge (23.11 ± 3.745). But there is no significant difference between the financial risk tolerance scores of the some and a lot financial knowledge groups ($p=0.268$). The mean score of financial risk tolerance increases with the level of perceived financial knowledge thus suggesting that more confidence in financial knowledge leads to high risk tolerance. The number of participants with little financial knowledge were 54, participants with some financial knowledge were 153 and a lot of financial knowledge were 37.

Table 4.55: One Way ANOVA Financial Risk Score and Financial Knowledge

Financial Risk Tolerance Score

	N	Mean	Std. Deviation	F	Sig.
Little	54	23.11	3.745	9.864	.000
Some	153	25.95	5.070		
A Lot	37	27.32	5.244		
Total	244	25.53	5.011		

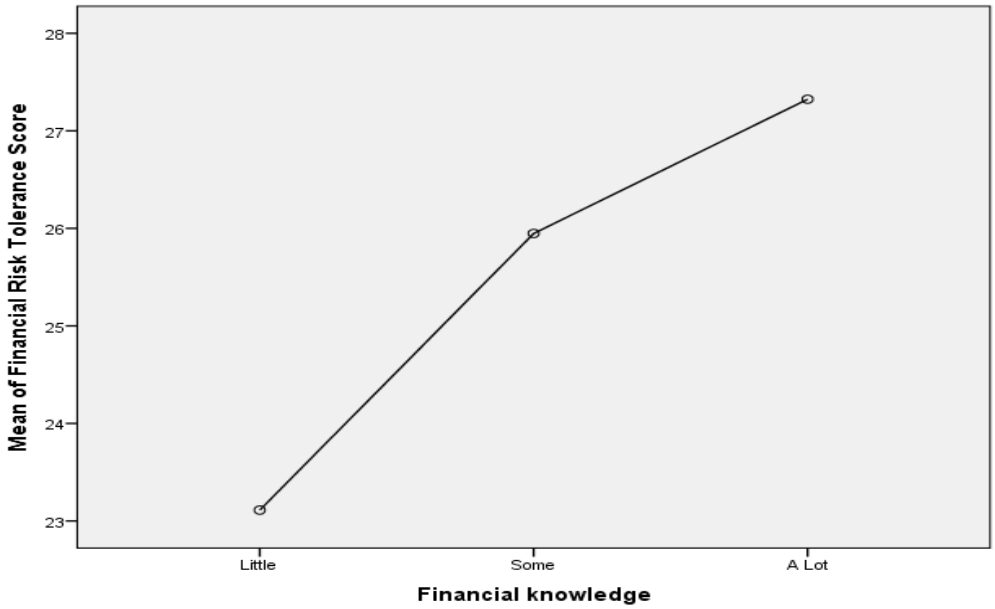

Figure 4.8: Means Plot for One Way ANOVA

4.4.3 Differences in performance over the final blocks of Iowa Gambling Task based on Financial Risk Tolerance (H4)

H: There are significant differences in card selection based on financial risk tolerance

There were significant differences based on financial risk tolerance in selection of cards from deck B and deck D according to the One-Way ANOVA ($F(242,1) = 6.848$, $p<0.05$) and ($F(242,1) = 4.201$, $P<0.05$) respectively. The high risk tolerant (10.81) individuals selected more cards from the deck B (disadvantageous) as compared to the low risk tolerant ones (8.1). The low risk tolerant individuals (16.96) were found to have selected more cards

from the deck D (advantageous deck) as compared to the high risk tolerant individuals (13.97).

Table 4.56: One Way ANOVA for differences in deck selection based on financial risk tolerance category

ANOVA

		N	Mean	Std. Deviation	F	Sig.
A	Low Risk tolerance	146	21.01	13.725	.069	.793
	High Risk Tolerance	98	20.55	13.150		
	Total	244	20.83	13.472		
B	Low Risk tolerance	146	8.1096	7.52570	6.848	.009
	High Risk Tolerance	98	10.8163	8.47719		
	Total	244	9.1967	8.01556		
C	Low Risk tolerance	146	13.9178	14.03960	.170	.681
	High Risk Tolerance	98	14.6633	13.57297		
	Total	244	14.2172	13.83077		
D	Low Risk tolerance	146	16.9589	11.94463	4.201	.041
	High Risk Tolerance	98	13.9694	9.89684		
	Total	244	15.7582	11.24232		

H: There are significant differences in the performance of Iowa gambling task in the final blocks based on financial risk tolerance categories

In order to understand the performance differences of the gambling task among the high and low risk tolerant respondents mixed measures factorial ANOVA was calculated. There was a main effect of Block on the performance of the participants over the final three blocks ($F(1.926, 242) = 5.313$, $p<0.05$) which means the participants performance improved over the last three blocks (see figure 6a). There was a significant interaction for the two independent variables blocks and financial risk tolerance categories ($F(1.926, 242) = 3.135$, $p<0.05$). The following figure also shows that the low risk tolerance individuals learn to select from the advantageous decks but the high-risk tolerance individuals do not

learn. But the main effect of financial risk tolerance is not significant (F (1, 242) = 1.534, p>0.05)). This means that it cannot be concluded that in general on the gambling task low risk tolerance individuals outperform the high risk tolerant individuals.

Table 4.57: Mixed Measure Factorial ANOVA

	df	Mean Square	F	Sig.	Partial Eta Squared
Blocks	1.926	212.021	5.313	0.006	0.021
Blocks* Financial_Risk_Category interaction	1.926	125.102	3.135	0.046	0.013
Main effect of Financial Risk Category	1	424.345	1.534	0.217	0.006

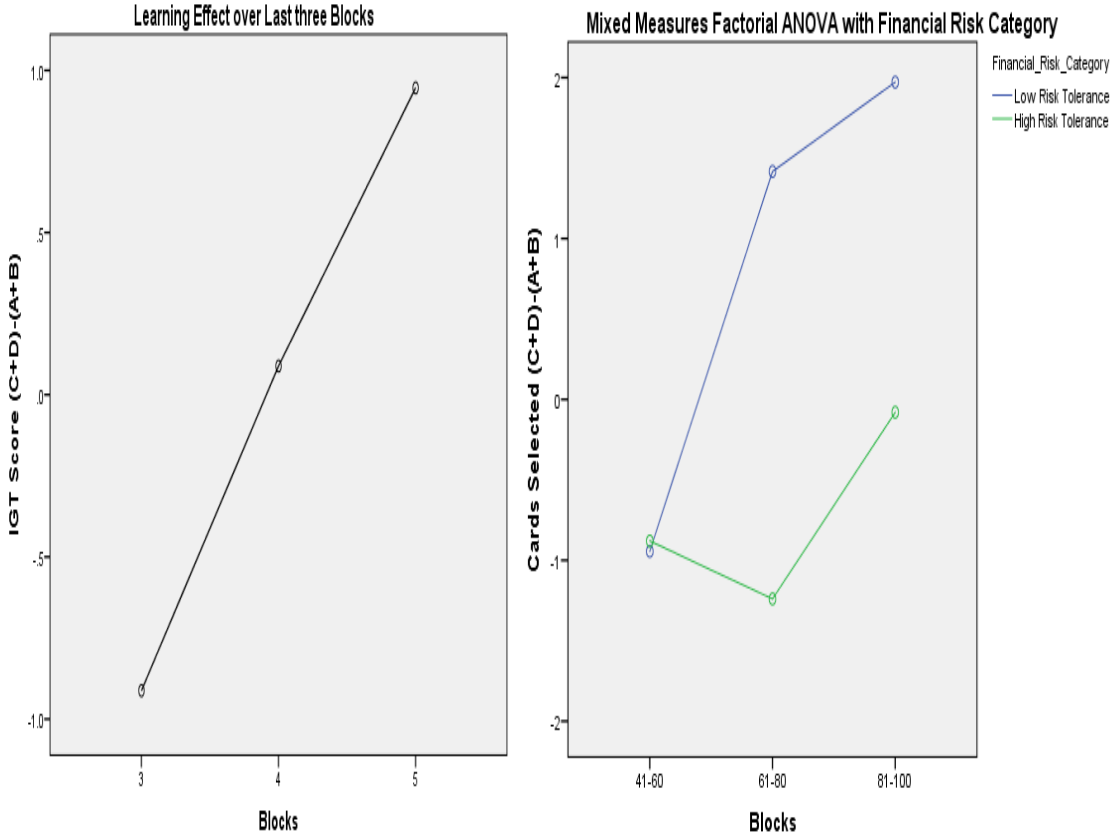

Figure 4.9. a) Learning Effect over the last three blocks b) Performance comparison of the High Risk Tolerant and Low Risk Tolerant respondents in the final three block the scores after 60, 80 and 100 trials are displayed

4.4.4 Financial Risk Tolerance and Balloon Analogue Risk Task (H5)

H5: There are significant differences in the risk taking behavior (number of explosions and average number of pump counts) among the financial risk tolerance categories

The calculation of One Way ANOVA showed that there were no significant differences in the number of explosions and average pump count on the basis of financial risk tolerance categories (F (4,236) =0.584, p=674) and (F (4,236) =0.745, 0.563).

Table 4.58: One Way ANOVA for differences in explosions and average pump count based on financial risk tolerance

ANOVA

		N	Mean	Std. Deviation	F	Sig.
Explosions	Low risk tolerance	15	3.80	2.34	.584	.674
	Below-average risk tolerance	63	5.08	3.28		
	Average/moderate risk tolerance	94	5.03	3.71		
	Above-average risk tolerance	48	5.27	3.50		
	High risk tolerance	21	5.43	3.97		
	Total	241	5.05	3.50		
Avg_PumpCount	Low risk tolerance	15	15.38	9.42	.745	.563
	Below-average risk tolerance	63	20.20	13.22		
	Average/moderate risk tolerance	94	19.35	13.82		
	Above-average risk tolerance	48	21.91	13.32		
	High risk tolerance	21	19.66	14.63		
	Total	241	19.86	13.38		

4.4.5 Iowa gambling Task Performance, Financial Knowledge and Financial Literacy (H6)

H6a: There is significant relationship between basic and advanced financial literacy and the Iowa gambling task variables

Card deck A (disadvantageous deck) was not related to basic and advanced financial literacy. Cards deck B (disadvantageous deck) had a very weak negative relationship with basic financial literacy (r= -0.14, n=244, p<0.05) and a very weak positive relationship with financial knowledge (r=0.15, n=244, p<0.05). Card deck C (advantageous deck) had a very

weak positive relationship with financial literacy (r=0.14, n=244, p<0.05) and basic financial literacy (r=0.18, n=244, p<0.001).

H6b: There are significant differences in Iowa gambling task performance based on level of perceived financial knowledge and actual financial literacy

This hypothesis was tested by using the following hypotheses:

4.4.5.1 Card Selection differences based on Financial Literacy

H: There are significant differences in card selection based on the financial literacy category of the respondent

The calculation of One Way ANOVA for each deck of cards showed that there were significant differences in card selection from deck A on the basis of financial literacy (F (1, 242) =4.404, p=0.037). Mean number of cards selected by highly financially literate respondents was 37.41 as compared to the low financially literate individuals mean 31.64 cards selected from deck A which implies that the more literate individuals selected cards from the disadvantageous deck A. There was no significant difference in the number of cards selected based on the financial literacy from deck B (F (1,242) =0.779, p=0.378), deck C (F (1,242) =2.783, p=0.097) and deck D (F (1,242) =0.000, p=0.004). Thus, it can be concluded that financial literacy did not significantly affect the selection of cards from the decks except for the deck A.

Table 4.59: Card Selection differences from each deck ANOVA based on Financial Literacy

ANOVA

		N	Mean	Std. Deviation	F	Sig.
A	Low Literacy	70	31.64	19.123	4.404	.037
	High Literacy	174	37.41	19.522		
	Total	244	35.75	19.544		
B	Low Literacy	70	17.90	15.086	.779	.378
	High Literacy	174	16.43	10.210		
	Total	244	16.85	11.802		
C	Low Literacy	70	25.51	21.681	2.783	.097
	High Literacy	174	21.21	16.673		
	Total	244	22.44	18.308		
D	Low Literacy	70	24.94	18.993	.000	.994
	High Literacy	174	24.96	13.997		
	Total	244	24.95	15.553		

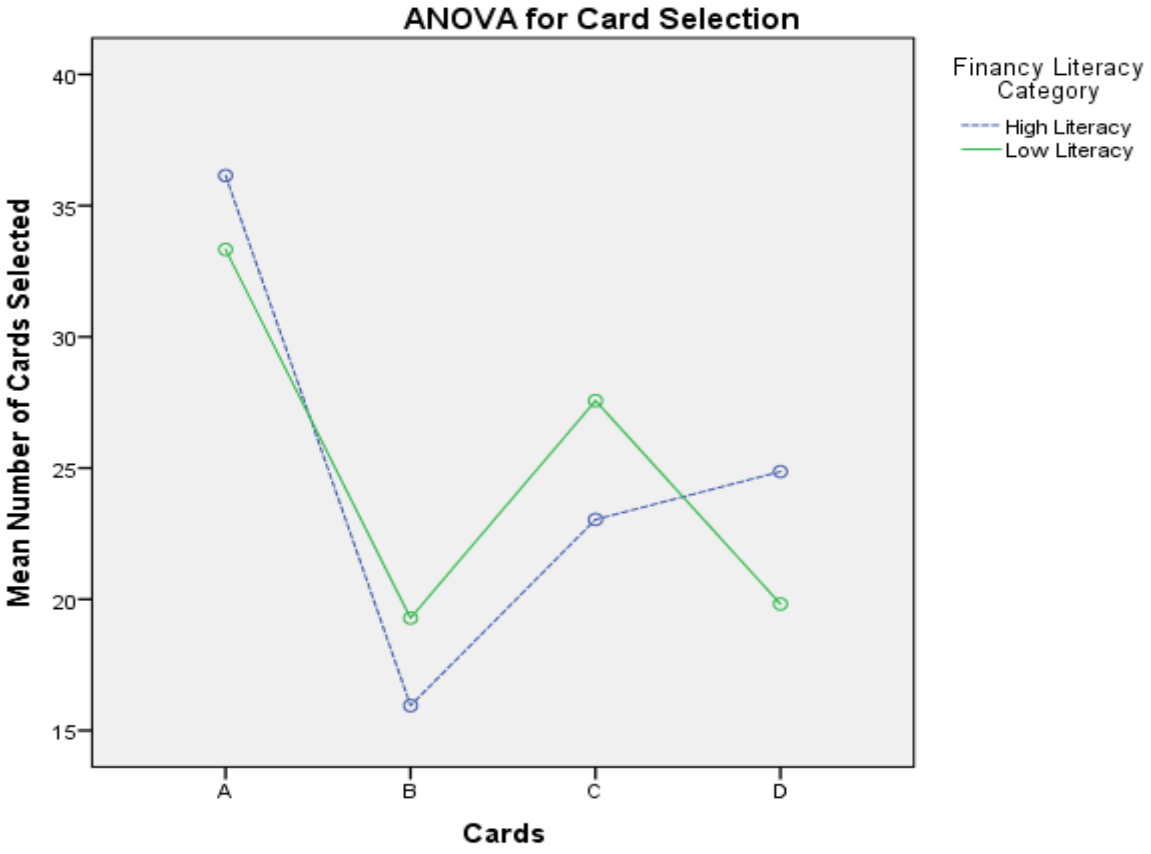

Figure 4.10: Mean Number of cards selection from each deck

4.4.5.2 Financial Knowledge, Financial Literacy and differences in performance over the final blocks of the gambling task

H: There are significant differences in Iowa gambling task performance based on financial knowledge and actual financial literacy in the final blocks

In order to understand the performance differences of the gambling task among the financial knowledge, high and low financial literacy respondents mixed measures factorial ANOVA was calculated. There was no significant interaction for the two independent variables blocks and financial knowledge categories ($F(3.84, 457.407) = 1.138$, $p>0.05$). Therefore, differences in learning effects/performance of the task did not significantly differ among the different levels of financial knowledge. The main effect of financial knowledge was not significant ($F(2, 238) = 0.802$, $p>0.05$)).

The interaction of the blocks and financial literacy was not significant ($1.92, 457.407) = 0.855$, $p>0.05$). The main effect of financial literacy was also not significant ($F(1, 238) = 1.126$, $p>0.5$). This means that it cannot be concluded that in general on the gambling task high financial literate individuals outperform the low financial literacy individuals.

Table 4.60: Mixed Measure Factorial ANOVA

	df	Mean Square	F	Sig.	Partial Eta Squared
Blocks* Financial Knowledge interaction	3.84	45.582	1.138	0.338	0.009
Main effect of Financial Knowledge	2.00	223.537	0.802	0.450	0.007
Blocks* Financial Literacy Interaction	1.92	34.268	0.855	0.422	0.004
Main Effect of Financial Literacy	1.00	313.704	1.126	0.290	0.005

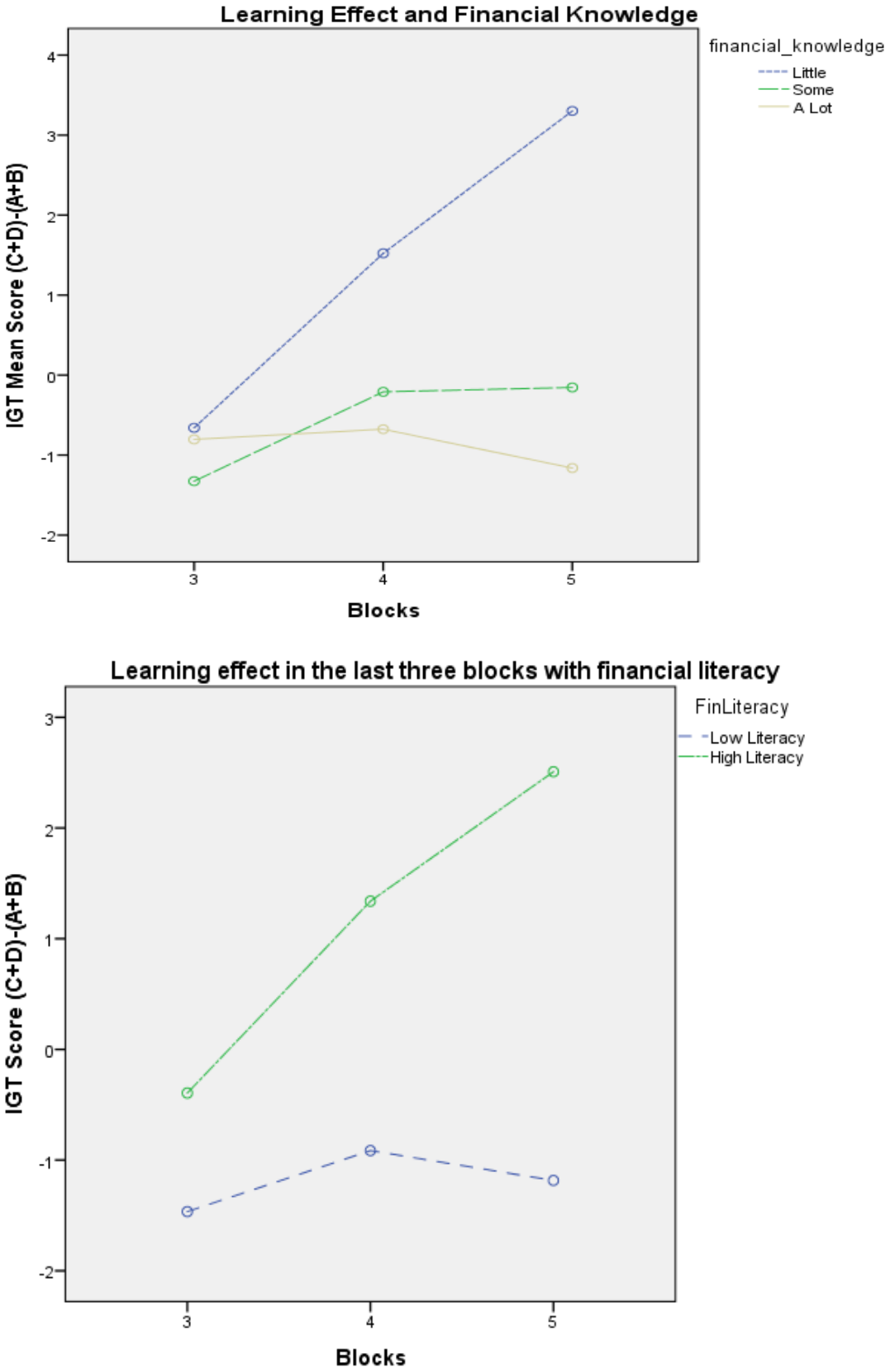

Figure 4.11: a) Learning Effect over the last three blocks with factor financial knowledge b) Performance comparison of the High financial literacy and Low financial literacy respondents in the final three block the scores after 60, 80 and 100 trials are displayed

4.4.5.3 Perceived and Actual Financial Knowledge Categories and comparison of the performance on the Iowa Gambling task

H: There are significant differences in the overall performance of the Iowa gambling task performance at different levels of financial knowledge and financial literacy

The repeated measure ANOVA was calculated for different levels of perceived and actual financial knowledge. The category with same level of financial knowledge as perceived (little, low financial literacy) and (a lot, high financial literacy) had significant learning effect in the task as ($F(2.302, 48.34) = 4.172$, $p<0.05$) and ($F(4, 132) = 3.702$, $p = 0.007$) respectively. The respondents with either high actual literacy/knowledge or some perceived financial knowledge also learned to make better choices in the task ($F(3.358, 359.324) = 5.269$, $p=0.001$). While the categories of (little, high financial literacy), (Some, Low financial literacy) and (a lot, Low financial literacy) did not learn to improve their decisions over the five blocks (See Figure 5.12). Thus, it can be concluded that the respondents who had same level of financial literacy as their perceived financial knowledge performed better than the ones who stated differently.

Table 4.61: Mixed Factor ANOVA for Perceived Financial Knowledge and Actual Financial Literacy and Iowa gambling task performance

Financial Knowledge			df	Mean Square	F	Sig.	Partial Eta Squared
Little	High Financial Literacy	Blocks	2.925	166.598	2.247	.090	.068
	Low Financial Literacy	Blocks	2.302	290.227	4.172	.017	.166
Some	High Financial Literacy	Blocks	3.358	303.882	5.269	.001	.047
	Low Financial Literacy	Blocks	2.984	167.551	2.454	.066	.053
A Lot	High Financial Literacy	Blocks	4	268.947	3.702	.007	.101
	Low Financial Literacy	Blocks	1.290	24.598	.480	.592	.193

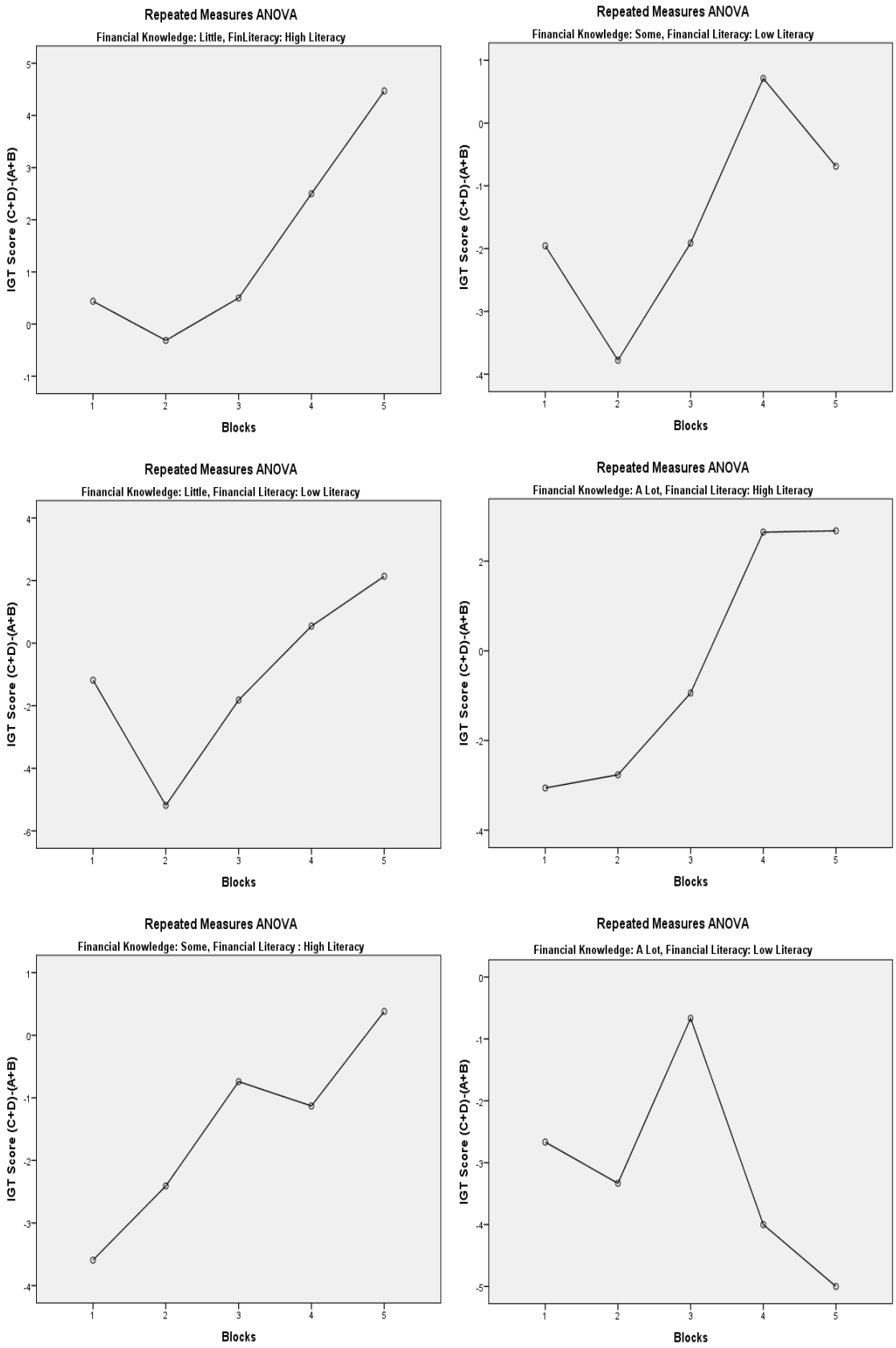

Figure 4.12: Repeated Measures ANOVA for comparison of different levels of perceived and actual Financial Knowledge through five blocks of the Iowa gambling task

4.4.5.4 Association between financial literacy, Financial Knowledge and normal performance on the Iowa gambling Task

H: There is significant association between different levels of financial knowledge, financial literacy and performance being normal/non-normal in the Iowa gambling task

There was a no significant association between normal performance on the Iowa gambling task and actual financial knowledge/ Financial Literacy as $\chi 2$ (1) =0.084, p>.05. The level of association 0.019 calculated using Phi and Cramer's V which reflects a weak association. Thus, it can be said that the normal performance or non-normal performance on the Iowa gambling task is not associated with the actual level of that individual's financial literacy. There was a no significant association between normal performance on the Iowa gambling task and financial knowledge as $\chi 2(2)$ =0.569, p>.05. The level of association 0.048 calculated using Phi and Cramer's V which reflects a very weak association. Thus, it can be said that the normal performance or non-normal performance on the Iowa gambling task is not associated with the level of perceived financial knowledge.

Table 4.62: Cross Tabulation for association between normal performance, financial knowledge and financial literacy

Crosstab

		Financial knowledge				Financial Literacy		
		Little	Some	A Lot	Total	Low Literacy	High Literacy	Total
Normal	Non-Normal Performance	28	88	20	136	38	98	136
	Normal Performance	26	65	17	108	32	76	108
Total		54	153	37	244	70	174	244

4.4.6 Balloon Analogue Risk Task and financial Literacy (H8)

H8: There is significant relationship between basic, advanced financial literacy and number of explosions, average number of pump counts (BART variables)

There was no significant relationship between number of explosions, average number of pump counts and financial literacy variables. The only very weak negative significant

relationship was between age and number of explosions (r= -0.17, n=244, p<0.01) and age and average number of pump counts (r= -0.18, n=244, p<0.01).

4.4.7 Balloon Analogue Risk Task, financial knowledge and financial literacy (H9)

H9: The number of explosions, average number of pump counts is significantly related to financial knowledge and financial literacy

The calculation of One Way ANOVA showed that there are no significant differences in explosions and average pump count on the basis of financial knowledge (F (2,241) =1.289, p=0.277) and (F (2, 241) = 0.3, p=0.741) respectively. There was no significant difference in the number of explosions and average pump count based on the financial literacy (F (1,242) =0.861, p=0.354) and (F (1,242) =2.573, p= 0.110) respectively. Thus, it can be concluded that different levels of financial knowledge and financial literacy do not significantly affect the performance of the balloon analogue risk task performance.

Table 4.63: One Way ANOVA for differences in explosions and average pump count based on financial knowledge and financial literacy

ANOVA

Financial Knowledge		N	Mean	Std. Deviation	F	Sig.
Explosions	Little	54	4.8148	2.81555	1.289	.277
	Some	153	5.3268	3.79894		
	A Lot	37	4.3784	2.94723		
	Total	244	5.0697	3.48885		
Average Pump Count	Little	54	20.0833	10.94888	.300	.741
	Some	153	20.1743	14.47770		
	A Lot	37	18.3076	11.42507		
	Total	244	19.8711	13.30543		

Financial Literacy		N	Mean	Std. Deviation	F	Sig.
Explosions	Low Literacy	70	4.7429	3.22439	.861	.354
	High Literacy	174	5.2011	3.59026		
	Total	244	5.0697	3.48885		
Average Pump Count	Low Literacy	70	17.7239	12.03559	2.573	.110
	High Literacy	174	20.7349	13.72138		
	Total	244	19.8711	13.30543		

4.5 Statistical Analysis and Results for the hypotheses related to RQ3

4.5.1 Prediction of Financial Risk Tolerance Score Using Combination of Demographic Variables (H1)

H1: There is a combination of demographic variables that predict the financial risk tolerance score

Multiple regression was used to identify the combination of socio demographic variables that predict financial risk tolerance score. The variables which showed significant relationship with financial risk tolerance score using Pearson Correlation (See **Error! R eference source not found.**) including Gender, Spontaneous decision-making style, Extraversion, Neuroticism, Openness to experience, Financial literacy Score and investment experience were entered as predictors in the regression model. But only gender, investment experience, financial literacy score, spontaneous decision making and extraversion personality traits were found to predict financial risk tolerance score. The regression model R^2 value of 0.28 means that 28% of the variation in financial risk tolerance score can be explained by the predicting variables.

Table 4.64: Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.529[a]	.280	.261	4.316	1.962

a. Predictors: (Constant), NoExpVs5yrs, Extraversion, Gender, Spontaneous, Financial Literacy, NoExpVs1to5yrs
b. Dependent Variable: Financial_Score

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1707.052	6	284.509	15.276	.000[b]
	Residual	4395.524	236	18.625		
	Total	6102.576	242			

a. Dependent Variable: Financial_Score

b. Predictors: (Constant), NoExpVs5yrs, Extraversion, Gender, Spontaneous, Financial Literacy, NoExpVs1to5yrs

The F value is 15.276 and the significance value is .000 $p < .001$. Thus, the regression model predicts financial risk tolerance score significantly well. The regression model which defines the causal relationship between financial risk tolerance score and its predictor or explanatory variables is as follows:

Financial risk tolerance score = b0 + b1*gender + b2*financial literacy score + b3*Spontaneous + b4*Extraversion + b5* NoExpVs1to5yrs + b6* NoExpVs5yrs+ ε

Financial risk tolerance score = 14.924 + 1.489*gender + 0.312*financial literacy score + 1.092*Spontaneous + 0.978*Extraversion + 3.442* NoExpVs1to5yrs + 1.578* NoExpVs5yrs+ ε[4]

Table 4.65: Regression Model Coefficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	14.924	1.421		10.504	.000		
	Gender	1.489	.605	.148	2.462	.015	.842	1.188
	Financial Literacy	.312	.111	.186	2.805	.005	.694	1.440
	Spontaneous	1.092	.337	.188	3.245	.001	.904	1.106
	Extraversion	.978	.374	.153	2.617	.009	.898	1.113
	NoExpVs1to5yrs	3.422	.778	.322	4.399	.000	.570	1.755
	NoExpVs5yrs	1.578	.772	.153	2.044	.042	.544	1.838

a. Dependent Variable: Financial_Score

[4] The financial risk tolerance score for a female with low financial literacy, highly spontaneous decision style, high extraversion and no investment experience when calculated gives 24.74. (Financial Risk Score= 14.924+ 1.489*(0) + 0.312*(5) + 1.092* (4) +0.978* (4) +3.422*(0) +1.578*(0)).

The lack of autocorrelation is tested using Durbin Watson test in this case the value is 1.962 which means the assumption is met as it should be greater than 1. The average VIF value is 1.4 which is close to 1 and the tolerance values are all above 0.2 this confirms that collinearity is not a problem for this model (Field, 2013).

4.5.2 Prediction of Financial Literacy Score Using Combination of Demographic Variables (H2)

H2: There exists a combination of demographic Variables, personality traits and decision making styles that predict financial literacy score

Multiple regression was used to identify the combination of socio demographic variables that predict financial literacy score. The variables which showed significant relationship with financial risk tolerance score using Pearson Correlation (See *Table 4.10: Relationship among the Variables calculated using Pearson Correlations*) including Gender, age, Rational/Vigilance decision making style, Intuition, financial knowledge, neuroticism, conscientiousness, openness to experience, Financial risk tolerance Score and investment experience were entered as predictors in the regression model. But only gender, investment experience, financial risk tolerance score, vigilance decision making and intuition were found to significantly predict financial literacy score. The regression model R^2 value of 0.366 means that 37% of the variations in financial literacy score of individuals can be explained by the predicting variables.

Table 4.66: Regression Model and ANOVA table

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.605[a]	.366	.350	2.411	2.012

a. Predictors: (Constant), NoExpVs5yrs, Financial Score, Intuition, Gender, Vigilance, NoExpVs1to5yrs
b. Dependent Variable: Financial Literacy

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	791.475	6	131.912	22.700	.000[b]
	Residual	1371.422	236	5.811		
	Total	2162.897	242			

a. Dependent Variable: Financial Literacy
b. Predictors: (Constant), NoExpVs5yrs, Financial Score, Intuition, Gender, Vigilance, NoExpVs1to5yrs

The F value is 22.7 and the significance value is $p < .001$. Thus, the regression model predicts financial literacy score significantly well. The regression model which defines the causal relationship between financial risk tolerance score and its predictor or explanatory variables is as follows:

Financial literacy score = b0 + b1*Gender + b2*financial risk tolerance score + b3*Vigilance - b4*Intuition + b5* NoExpVs1to5yrs + b6* NoExpVs5yrs+ ε

Financial literacy score = 0.46+ 1.522*Gender + 0.112*financial risk tolerance score + 0.911*Vigilance - 0.679*Intuition + 2.031* NoExpVs1to5yrs + 2.158* NoExpVs5yrs+ ε [5]

[5] The financial literacy score for a male having high financial risk tolerance score, with low intuitive decision making style, high on rational decision making style, more than 5 years of investment experience can be calculated using the formula as Financial literacy score= 0.46+1.522(1) + 0.112(27) + 0.911(2)-0.679(4) +2.158(1), Financial literacy score = 9.45.

All coefficients except intuition have positive signs as when they increase financial literacy score also increases but when intuition decision making style is more incorporated it makes the financial literacy score decrease and these both variables have a negative relationship.

Table 4.67: Table of Coefficients and Collinearity Statistics

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	.460	1.484		.310	.757		
	Gender	1.522	.328	.254	4.644	.000	.895	1.118
	Financial Score	.112	.035	.189	3.256	.001	.798	1.253
	Intuition	-.679	.226	-.163	-3.004	.003	.908	1.101
	Vigilance	.911	.284	.176	3.205	.002	.890	1.123
	NoExpVs1to5yrs	2.031	.427	.321	4.756	.000	.590	1.694
	NoExpVs5yrs	2.158	.408	.352	5.291	.000	.608	1.644

a. Dependent Variable: Financial Literacy

The lack of autocorrelation is tested using Durbin Watson test in this case the value is 2.0 which means the assumption is met as it should be greater than 1. The average VIF value is 1.3 which is close to 1 and the tolerance values are all above 0.2 this confirms that collinearity is not a problem for this model (Field, 2013).

4.6 Conclusion of the Chapter

The hypotheses were tested and the results were reported in the chapter. The most important relationships were identified to be between financial risk tolerance score, investment experience, perceived financial knowledge and financial literacy. The predictors of financial risk tolerance score were found to be gender, financial literacy, extraversion,

spontaneous decision style and investment experience. The determinants of financial literacy score were found to be gender, financial risk tolerance score, intuitive decision style, rational decision style and investment experience. The regression model for financial risk tolerance had a predictive power of 28% and the 36% of the variability in the financial literacy are explained by the predictors in the regression model developed. The Iowa gambling task performance did not differ based on the investment experience, financial literacy and demographics of the respondents. But an interaction effect between financial risk tolerance and performance on the Iowa gambling task was found to be significant. The respondents who had same level of financial literacy and perceived financial knowledge performed better on the Iowa gambling task performance.

5 Chapter Six: Findings and Discussion

5.1 Introduction of the Chapter

The findings and discussion of the hypotheses testing results are given in this chapter. The findings were divided into three parts according to the three research questions and their hypotheses. The findings are summarized and given in a tabular form and then discussed in detail with the comparison with previous researches.

5.2 Findings related to the relationship between Demographic factors, Personality Traits, Decision Making Styles and Financial risk tolerance, Financial literacy and Risky Decision Making (RQ1)

The following table summarizes the hypotheses and the tests applied as well as the findings of the test:

Table 5.1: Hypotheses, Analysis tests and the main findings for RQ1

	Hypotheses	Analysis	Findings
H1a	Gender and financial risk tolerance Score	Independent Samples T-Test	Related, females less risk tolerant than males
	Age and Financial Risk Tolerance	One Way ANOVA	No Significant Relationship
	Education and financial Risk Tolerance	One Way ANOVA	No Significant Relationship
	Investment Experience and Financial Risk Tolerance	One Way ANOVA	Related, non-investors low risk tolerance as compared to investors but as the investment experience increases investors become less risk tolerant
	Investment Instrument and Financial Risk Tolerance	One Way ANOVA	Equity/equity mutual funds and hedge funds or money market mutual funds investors have significant higher financial risk tolerance current account or deposit accounts investors

H1b	Personality Traits and Financial Risk Tolerance	Pearson Correlation, ANOVA	Extraversion and openness to experience related to higher risk tolerance, emotional stability related to higher risk tolerance
H1c	Decision making Styles and Financial Risk Tolerance	Pearson Correlation	Spontaneous decision making style related positively
H2a	Gender and Basic financial literacy	Independent Samples T-Test	Significant relationship
	Gender and advanced financial literacy		
	Age Categories and Basic financial literacy	One Way ANOVA	significant relationship, 18-25< (55-64) and (65 or Over)
	Age Categories and advanced financial literacy	One Way ANOVA	significant relationship, (35-54) lower than (65 or Over)
	Education levels and Basic financial literacy	One Way ANOVA	no significant relationship
	Education and advanced financial literacy		significantly different
	Investment Experience and Basic financial literacy	One Way ANOVA	significant differences, lower literacy of the respondents with no experience than 1-5 years' experience and more than 5 years' experience
	Investment Experience and advance financial literacy		
H2b	Gender and Perceived Financial Knowledge	Chi Square	Strong association
	Gender and actual financial literacy	Pearson Correlation	weak significant relationship
	Age and Perceived Financial Knowledge	Pearson Chi Square	Not significant association
	Age and actual financial literacy	One Way ANOVA	Significant differences
	Education and Perceived Knowledge	Pearson Chi Square	No significant association

	Education and Actual financial literacy	One Way ANOVA	Significant differences
	Investment Experience and Perceived Knowledge	Pearson Chi Square	significant association, Significant differences
	Investment Experience and actual financial literacy	One Way ANOVA	
H3a	Personality Traits and Basic financial literacy	Pearson Correlation	weak negative relationship with neuroticism
	Personality Traits and Advance financial literacy		weak negative relationship with neuroticism and positive relationship with openness to experience
	Decision Making Styles and Basic financial literacy	Pearson Correlation	negative relationship with intuition, negative relationship with spontaneous and positive relationship with vigilance
	Decision Making Styles and Advance financial literacy		negative relationship with intuition and positive relationship with vigilance
H3b	Personality Traits and Perceived Financial Knowledge levels	One-Way ANOVA	Significant differences for extraversion, conscientiousness, openness to experience and neuroticism
	Personality Traits and Actual financial literacy	Pearson Correlation	positive relationship with conscientiousness and openness to experience while negative relationship with neuroticism
	Decision Making Styles and Perceived Financial Knowledge	One Way ANOVA	no significant differences
	Decision Making Styles and Actual financial literacy	Pearson Correlation	negative relationship with intuition and positive relationship with vigilance
H4	Demographics and Iowa gambling Task	ANOVA	no significant differences
	Personality Traits and Iowa gambling Task	Pearson Correlation	Conscientiousness negatively related to selection from deck B, Conscientiousness trait respondents select more from deck A and less from deck C

H5	Investment Experience and Iowa gambling task Performance	Two Way Mixed factor ANOVA, ANOVA, Mixed factor ANOVA	Main effect of investment experience for RA and RP, No interaction effect or main effect of investment experience, significant differences in selection from deck C
H6	Personality Traits and Investment Experience	One Way ANOVA	High conscientiousness, high openness to experience and low neuroticism are related to more years of investment experience
H7	Demographics and BART	One Way ANOVA	Age, employment status and Ethnicity significant relationship
H8	Student and investor differences in Iowa gambling task performance	One Way ANOVA (card Selection differences)	No significant differences in card selection

The findings and discussion of each hypothesis is given one by one in the following headings.

5.2.1 Demographics and Financial Risk Tolerance (H1a)

Gender is significantly related to financial risk tolerance. Male participants are high in financial literacy and have high financial risk tolerance as compared to females. 55% of the male respondents were found to be high risk tolerance category while 71% of the females were found to be in the low financial risk tolerance category. This is in line with the results of studies including (Gibson et al. 2013; Sweet 2013). There is no relation of financial risk tolerance and age, education, income, marital status which is in contradiction with other studies (Grable, 2000; Finke and Huston, 2003; Anbar and Eker, 2010; Sulaiman, 2012; Gibson et al., 2013; Kannadhasan, 2015).

Financial risk tolerance is related to financial literacy and investment experience which has been also reported by Grable (2000) and Gibson et al. (2013) respectively. It was found that the individuals who had no investment experience had significantly lower financial

risk tolerance than investors but the more than 5 years' investment experience respondents had lower financial risk tolerance score than the less experienced investors which was also mentioned in a research by Sapra, et al. (2012) that experienced investors don't take extraordinary risk and have a long term perspective about things.

The financial risk tolerance score was found to be higher for the higher level of perceived financial knowledge. Thus, meaning that higher the confidence an individual has in his/her financial understanding the more likely they are to take more risks.

5.2.2 Personality Traits and Financial Risk Tolerance (H1b)

The findings confirm the relationship of risk tolerance and personality types. The extraversion and openness to experience are positively related to high risk tolerance while neuroticism is negatively related. Nicholson et al. (2005) also reported that high risk taking is related to extraversion and openness to experience traits while neuroticism, conscientiousness and agreeableness are related to less risk taking. The study by Filbeck et al.(2005) suggests that personality is related to risk tolerance and Contessa et al. (2013) also concluded that extraversion, thinking and perception are the personality traits of surgeons which are related to high risk tolerance. The findings also are in line with Pan and Statman (2010) who reported that extraversion and openness to experience are related to high risk tolerance they did not find any relationship with agreeableness as well but reported a negative relationship with conscientiousness which is not found in this research.

Wong and Carducci (2013) also found extraversion and openness to experience to be positively related to risk taking and agreeableness and conscientiousness are negatively related and Lin and Lu (2015) concluded that bettors with extraversion, openness to experience as well as and agreeableness had higher risk tolerance.

5.2.3 Financial Risk Tolerance and Decision making Styles (H1c)

The Pearson correlations calculation shows that there is a significant relationship between financial risk tolerance score and spontaneous decision making style while no significant relationship was found with other decision making styles. Therefore, the respondents who have high risk tolerance score are more likely to make decisions which are on the spur of the moment and not based on research or factual data. Intuition and spontaneous decision making styles have moderate significant positive relationship and vigilant/rational decision making style is negatively correlated with spontaneous decision making style this finding was also reported by previous research (Thunholm, 2004; Baiocco et al., 2009; Curseu and Schruijer, 2012). Other Significant relationships were between personality traits and decision making styles conscientiousness, openness to experience and agreeableness personality traits were significantly related to vigilance. Spontaneous decision style was found to be positively correlated with extraversion and negatively related to conscientiousness. Intuitive decision making style was found to be weakly related to all personality traits apart from neuroticism. The spontaneous decision making style was found to be significantly related to selection from deck B which is a disadvantageous deck in the Iowa gambling task.

5.2.4 Demographics, Actual Financial literacy (Basic and Advanced) and Perceived Financial Knowledge (H2)

The chi square test of association was calculated for perceived financial knowledge and actual financial literacy which was moderately strong indicating association of the two variables. The Pearson correlations for the two variables was calculated which was weak positive as compared to the previous research's (Agnew and Szykman, 2005; Hung et al., 2009; Parker et al., 2012) which have identified a moderate relationship. Pearson correlation was calculated for all the demographic groups between actual financial literacy and perceived financial knowledge which ranged from 0.2-0.7 and did not exceed 0.7,

Agnew and Szykman (2005) reported a range of correlation 0.10 to 0.78 which is similar to our range. Parker et al. (2012) reported a moderate correlation of 0.366 perceived financial knowledge which they termed as confidence-knowledge with financial knowledge/literacy. Therefore, both perceived financial knowledge and actual financial literacy are not the same and financial literacy should be calculated not self-reported by the respondent.

The independent T-Test showed that male respondents had significantly higher basic and advanced financial literacy as compared to females. The 46% of males answered all three questions of the basic financial literacy correctly while for females only 17% answered all the questions correctly. This difference was also seen in advanced literacy as the mean number of questions answered by the females was 4 while for males it was 6. This is in line with the findings of previous researches such as (van Rooij et al., 2011;Lusardi and Mitchelli, 2007; Lusardi and Mitchell, 2008).

There was a significant association between gender and financial knowledge as well as financial literacy and it was found that males have high Perceived Financial Knowledge as compared to females as well as actual financial knowledge/ financial literacy. The males not only were more confident about their knowledge but also had higher level of actual financial literacy than females. Goldsmith and Goldsmith (2006) also found that men know better about financial investing and are also more confident about their knowledge as compared to the females. The females in the high perceived knowledge and high financial literacy were 86% as compared to the males who were 93% in this category. The low financial knowledge and low actual financial literacy also showed a difference in males and females which was 21% Vs 48%. In this case our findings are similar to the one reported by Bannier and Neubert, (2016) who also reported more females were in the high perceived and low actual literacy category which is also the case in our study 14% to 7% of males.

Other researches that reported financial literacy does differ among both genders (for example Chen and Volpe 2002; Beal and Delpachitra 2003; Fonseca et al., 2012; Lusardi 2015) while (Mandell and Klein, 2007; (Noon and Fogarty, 2007) reported no relationship. The respondent's basic and advanced financial literacy was differed among the age groups basic financial literacy increased with age and there were significant differences in age groups 18-25, 55-64 and 65 or over where lowest basic literacy was of the age group 18-25. While advanced financial literacy of age group 65 or Over was significantly higher than age group 35-54. van Rooij et al. (2011b) reported that advanced financial literacy of middle aged individuals 40-60 was highest as compared to other age groups either younger or 61 or older. Lusardi (2015) also reported that the financial literacy is lower in younger respondents as compared to older ones. The perceived and actual financial literacy both have a significant association and relationship with age. The relationship was found to be weak but significant. Chen and Volpe (2002) and (Hung et al., 2009) also reported that age does effect financial literacy while Noon and Fogarty (2007) did not them related to each other.

The basic financial literacy did not differ among the education levels but advanced financial did differ. The researches that also reported financial literacy differences according to education included (Mandell and Klein, 2007; Lusardi and Mitchell, 2008; Hung et al., 2009) while Noon and Fogarty (2007) found no relationship of education and financial literacy. Basic financial literacy differed according to the employment status and the individuals who were retired had higher basic financial literacy than the ones unable to work and employed for wages.

The basic and advanced financial literacy both differ among the respondents with different investment experiences in years. The lowest level of basic and advanced financial literacy was of the respondents who had no investment experience, higher for the 1-5 years of

experience and highest in the respondents with more than 5 years of investment experience. There was a significant moderate relationship between investment experience and actual financial literacy while weak relationship with perceived financial knowledge.

5.2.5 Personality Traits, Actual Financial literacy (Basic and Advanced) and Perceived Financial Knowledge (H3)

Basic financial literacy was found to be related negatively to neuroticism, advanced financial literacy was also found to be negatively related to neuroticism and positively related to openness to experience. Financial literacy had a positive relationship with conscientiousness and openness to experience while negative relationship with neuroticism. Our findings did not show any relationship of financial literacy and agreeableness as reported by Noon and Fogarty (2007) but they did mention relationship with neuroticism. Personality traits significantly differed among the Perceived financial knowledge levels including extraversion, conscientiousness openness to experience and neuroticism but not for agreeableness.

Basic financial literacy had a negative relationship with intuition, negative relationship with spontaneous and positive relationship with vigilance decision making styles. Advanced financial literacy was negatively related with intuition and positively related with vigilant decision making style. Actual financial literacy was negatively related to intuitive decision making style and positively related to vigilant decision making styles but no significant relationship was found between decision making styles and perceived financial knowledge. There were no significant differences in decision making styles based on perceived financial knowledge levels.

5.2.6 Demographics and Iowa Gambling Task Performance (H4a)

Gender, age, ethnicity, education, financial knowledge and investment experience were not found to be significantly related to the Iowa gambling task. This is in contradiction with

the findings of Hooper et al. (2004) and Cauffman et al. (2010) who found age related differences in the Iowa gambling task performance as well as gender differences. Evans et al. (2004) found no relationship of the other demographic variables and the Iowa gambling task performance except for education which was not found in our sample.

5.2.7 Personality Traits and Iowa Gambling Task (H4b)

There were no significant differences in selection from the decks A, B, C and D based on the personality traits apart from the Conscientiousness trait. The net Score (C+D)-(A+B) also was significantly high for the respondents who had undirectedness as opposed to the ones high on conscientiousness. Brand and Altstötter-Gleich, (2008) did not find any relationship of personality traits apart from perfectionism and Suhr and Tsanadis (2007) did find relationship of state mood and fun seeking with gambling task performance. The individuals who are high in conscientiousness are more self-disciplined, dutiful, competent and think before acting this trait was also found significantly related to vigilance/rational decision making task as expected but in this case the individuals high on conscientiousness have chosen from the risky disadvantageous deck A and less from the advantageous and less risky deck C. This is in contradiction with the finding reported by Peterson (2011) that investors who have conscientiousness trait make less risky decisions as compared to the high impulsive/undirectedness trait investors.

5.2.8 Investment Experience and Iowa gambling task Performance (H5)

The card selection differences based on investment experience showed that deck C significantly differed in being selected by investors having more than five years of experience and non-investors. Deck C is one of the advantageous decks and it can be concluded that the more experienced investors select more from this deck as compared to non-investors. The two-way mixed factor ANOVA for RA and RP with effect of investment experience found a significant main effect on the overall learning of investment

experience. The mixed factor ANOVA for investment experience showed no significant effect or interaction for investment experience on Iowa gambling task performance.

5.2.9 Personality Traits and Investment Experience (H6)

The differences in personality traits based on investment experience were found to be significant and high conscientiousness, high openness to experience and low neuroticism are related to more years of investment experience. Thus it can be said that with the increase in investment experience individuals become more motivated, orderly, dutiful (conscientiousness), imaginative, emotionally sensitive (openness to experience) and less impulsive, angry and vulnerable (Neuroticism) (Cooper, 2015).

5.2.10 Demographics and BART (H7)

White et al. (2008) found a relationship of gender and the behavioral risk taking task but no other demographic variables but in our study, there was no relationship of gender and BART variables but significant differences in average pump count were found on the basis of age, employment status and ethnicity. The younger respondents showed high risk taking behavior than older ones which was also reported by Koscielniak et al. (2016), students were higher at risk taking than employed and retired individuals and middle eastern Arabs are high risk takers as compared to the British Whites. The results are significant for ethnicity but the number of respondents in both ethnicity groups is also worth mentioning here the sample consisted of 201 British Whites while the middle eastern Arabs are only 3 in number. The mean number of these three respondents was 12 for explosions and 46 average pump count as compared to the British whites who had mean number of explosions 4.8 and average pump count 19.

5.2.11 Students and Investor differences in Iowa gambling task performance (H8)

The results of one Way ANOVA showed that both students and investors did not differ from each other in selection of cards from the four decks. The highest number of cards from

selected from deck A, then deck D, deck C and least from deck B. Therefore all the studies (Maia and McClelland, 2004; Bowman et al., 2005; Suhr and Tsanadis, 2007; Buelow and Suhr, 2009; Harman, 2011; Upton et al., 2011; Bull et al., 2015; Okdie et al., 2016) that considered students as their sampling unit the findings would have been similar even if they considered investors or other professionals.

5.3 Findings about the relationship among Financial Risk Tolerance, Financial Literacy and Risky Decision-Making Tasks (RQ2)

The following table summarizes the hypotheses tested, the statistical analysis techniques that was used and the results of the tests. In the next section, these hypotheses results are discussed in detail.

Table 5.2: Hypotheses tested, data analysis technique and the result of the tested hypotheses

	Hypotheses	Analysis	Findings
H1	Financial Risk Tolerance and Basic financial literacy	One Way ANOVA	Significant differences, higher risk tolerance high literacy
	Financial Risk Tolerance and Advanced financial literacy		Significant differences, higher risk tolerance high literacy
H2	Financial Risk Tolerance and Actual financial literacy		Significant differences
H3	Financial Risk Tolerance score and Perceived Financial Knowledge	One Way ANOVA	Significant differences
H4	Iowa gambling task Performance and financial risk Tolerance	Mixed Factor ANOVA, ANOVA (card Selection)	interaction significant no main effect
H5	BART and Financial Risk Tolerance	ANOVA	no significant differences
H6	Iowa gambling task performance and Basic financial literacy	Pearson Correlation	negative relationship with deck B, positive relationship with deck C
	Iowa gambling task performance and		no significant relationship

	Advanced financial literacy		
H7	Iowa gambling task performance and Perceived Financial Knowledge	Repeated measures ANOVA, Pearson Correlation	no significant interaction or main effect separately, learning effect significant for same level of perceived and actual financial knowledge, positive relationship with selection from deck B
	Financial Knowledge and Iowa gambling Task Performance	Mixed factor ANOVA, ANOVA Card Selection	No interaction effect or main effect of financial knowledge, significant differences in selection from deck B
	Iowa gambling task performance and Actual financial literacy	Pearson Correlation (cards selection)	positive relationship with deck C
H8	Balloon Analogue Risk Task and Basic financial literacy	Pearson Correlation	no significant relationship
	Balloon Analogue Risk Task and Advanced financial literacy		no significant relationship
H9	Balloon Analogue Risk Task and Perceived Financial Knowledge		no significant relationship
	Balloon Analogue Risk Task and Actual financial literacy		no significant relationship

5.3.1 Financial Risk Tolerance, Actual Financial literacy (Basic and Advanced) and Perceived Financial Knowledge (H1, H2, H3)

Basic and advanced financial literacy both are effected by financial risk tolerance and the results show that respondents with high risk tolerance also had high basic and advanced financial literacy. Below-average risk tolerant respondents had advance financial literacy than the other respondents with Average/moderate risk tolerance, Above average risk tolerance and the respondents with High risk tolerance. Perceived financial knowledge and actual financial literacy score both were significantly related to financial risk tolerance score. The results show that financial risk tolerance is positively related to financial literacy, financial knowledge and investment experience which implies that more experienced

investors have high financial risk tolerance and high financial literacy. Our study results contradict with findings of Beal and Delpachitra (2003) who found that risk preference is negatively related to financial knowledge and Cameron et al. (2014) who found that students with lower financial risk tolerance apply financial literacy concepts when making decisions as compared to students with high risk tolerance.

5.3.2 Iowa gambling task Performance and financial risk Tolerance (H4)

There were differences in card selection from deck B and deck D based on financial risk tolerance. The high risk tolerant individuals made disadvantageous selection and chose more from deck B (disadvantageous) and chose less cards from the advantageous decks. On the other hand, the low risk tolerant individuals were found to have selected more cards from the deck D (advantageous deck) and selected less from the deck B which was disadvantageous. Thus, the high-risk tolerance of the individuals does make them inclined to take more risks and sometimes they make less advantageous and more risky decisions. Mixed factor ANOVA calculations showed that there was no main effect of financial risk tolerance and thus it cannot be said that low risk tolerant individuals perform better than the high risk tolerant individuals but an interaction effect was found to be significant.

5.3.3 Financial Risk Tolerance and Balloon Analogue Risk Task (BART) (H5)

There were no significant differences in mean explosions and average pump count the variables measuring behavioral risk taking among the risk categories. Thus self-reported measure of risk is not significantly related to the behavioral risk taking which implies that both measures evaluate different aspects or dimensions of risk taking as also mentioned by Mishra and Lalumière (2011).

5.3.4 Iowa Gambling Task Performance, Actual Financial literacy (Basic and Advanced) and Perceived Financial Knowledge (H6, H7)

Basic financial literacy had a negative relationship with disadvantageous deck B but positive relationship with selection from advantageous deck C. Thus, meaning the individuals who have high basic financial literacy are likely to select from deck C and avoid deck B. The one-way ANOVA for the card selection differences according to actual financial literacy showed no differences in selection of cards from the decks except for the deck A. This means that highly financially literate individuals selected more cards from disadvantageous deck A which might be due to the high financial risk tolerance of the individuals. The card selection from decks did not differ based on the different levels of perceived financial knowledge. But there was a significant relationship with selection from deck B according to Pearson correlation. The mixed factor ANOVA was calculated to see learning effect across the five blocks of trials which showed no significant interaction or main effect of financial literacy or perceived financial knowledge but learning effect was found to be significant for same level of perceived and actual financial knowledge (for example low perceived knowledge and low financial literacy, high perceived financial knowledge and high financial literacy). The normal performance on the Iowa gambling task was not found to be associated with any financial literacy or perceived financial knowledge category.

5.3.5 Balloon Analogue Risk Task (BART), Actual Financial literacy (Basic and Advanced) and Perceived Financial Knowledge (H8, H9)

There was no relationship found between basic financial literacy, advanced financial literacy, perceived financial knowledge and actual financial literacy and variables of explosions, average number of pump counts.

It was identified in the results of ANOVA that selection of cards from deck B significantly differed based on perceived financial knowledge which is the disadvantageous deck. The

more confident individuals selected more (some =10 cards and a lot =9.8 cards while little =6.3 cards) from the deck B as compared to the less confident ones. Thus, The respondents who had more perceived financial knowledge selected more from this less frequent loss deck as compared to the ones who had little confidence about their level of financial knowledge. Tang and Baker (2016) found there is a significant association of financial behaviour and subjective financial knowledge but in the risky decision-making task we found no interaction or main effect of perceived financial knowledge on Iowa gambling task performance. Thus, more or less perceived financial knowledge the individuals perform similar on the risky decision task and do not differ from one another.

5.4 Predictors of the Financial Risk Tolerance Score and Financial Literacy Scores (RQ3)

The following table summarizes the hypothesis tested the statistical technique used for analysis and the findings.

Table 5.3: Hypotheses tested, data analysis technique and the result of the tested hypotheses

	Hypotheses	Data analysis technique	Findings
H1	Predictors of financial risk tolerance	Multiple Regression	Gender, Financial Literacy Score, Extraversion, Investment Experience (dummy variables), Spontaneous decision-making style
H2	Prediction of Financial Literacy Score by combination of Demographic variables	Multiple Regression	predictors of financial literacy score include gender, financial risk tolerance, investment experience, rational/vigilant and intuitive decision-making style

5.4.1 Predictors of Financial Risk Tolerance (H1)

The multiple regression model showed that 28% variation in financial risk tolerance can be explained by gender, financial literacy score, extraversion, spontaneous decision making and investment experience. All these variables have a positive relationship with financial

risk tolerance. There is a very interesting aspect of the relationship of investment experience and financial risk tolerance score. Investors have higher financial risk tolerance than the non-investors but the magnitude of the risk tolerance is higher for the investors with 1to 5 years of investing experience as compared to the more than 5 years investing experience investors as the coefficients for both the dummy variables are 3.422 and 1.578 respectively. Thus, the score of financial risk tolerance will be higher for less experienced investors as compared to the more experienced ones. The research by Hallahan et al.(2003) identified that gender, age, income and wealth predict financial risk tolerance while (Sweet, 2013b) found that gender and income are predictors of financial risk tolerance in our research only gender was found to be significantly predicting the financial risk tolerance score. Pan and Statman (2010) reported that extraversion and openness to experience predict financial risk tolerance but we only found extraversion to significantly predict financial risk tolerance. Despite the fact that openness to experience, neuroticism (negative) do show correlation (linear relationship) but in the regression model they are not significant predictors (p=0.725 and p=0.934 respectively). Our findings are in contradiction with the findings of Lauriola and Levin (2001) who found neuroticism and openness to experience being significant predictors of risk taking for gains. Anbar and Eker (2010) also found that gender is a significant predictor of financial risk tolerance in students. Financial knowledge was found to be correlated with financial risk tolerance score but the dummy variables were found not to significantly predict financial risk tolerance score the significance values for the dummy D1_littleVsSome was p=0.138 and for D2_alotVsSome was p=0.714. This is in contradiction with the results of Grable (2000) who found financial knowledge to be a significant predictor of financial risk tolerance. The predictors of our model explain 28% variation in financial risk tolerance score while the model by Grable (2000) explains 22% variation in financial risk tolerance.

5.4.2 Predictors of Financial Literacy Score (H2)

The regression model derived for predicting financial literacy score suggests that the predictors of financial literacy score include gender, financial risk tolerance, investment experience, rational/vigilant and intuitive decision making style. The relationship of intuitive decision style is negative with financial literacy and rational decision making style is positive. This is understandable as when an individual investor has a habit of getting information about the investment opportunities he/she has they do get a chance to learn more about the concepts of finance and this increases the literacy level of these investors while on the other hand if an individual is not bothered about the factual data and stock market situation the person just makes decisions using intuition and thus cannot improve the existing understanding he/she have. Investment experience dummy variables significantly predict financial literacy score. The personality traits did not have any significant predictive power as well as the financial knowledge. Therefore these two variables were not included in the regression model. Lusardi et al. (2010) reported that gender and education predict financial literacy but in our research, only gender was found to be a predictor.

5.5 Conclusion of the Chapter

The chapter gives detailed findings related to each hypothesis tested and also discusses how these findings are in contradiction or are similar to the past research using the same variables.

6 Chapter Six: Conclusion

6.1 Introduction of the Chapter

This chapter gives the summary of the main findings of the research and also discusses the major contributions, limitations and future research suggestions.

6.2 Main Findings

This study combined behavioural measures of decision under uncertainty and risk taking i.e. Iowa gambling task and balloon analogue risk task respectively with a self-report measure of financial risk tolerance to understand how high risk tolerant and low risk tolerant individuals differ from one another in close to real life investment decisions which also give the participant feedback about reward and punishment. The sample of 244 respondents consisted of 46% male and 54% female respondents who were between 18 to over 65 years of age while 50% of the respondents were in the age range 35-54. The 59% of the respondents were low risk tolerant and 41% high risk tolerant.

6.2.1 Financial Risk Tolerance, Demographics and Risky Decision Making

The study showed that there is a significant difference in financial risk tolerance of respondents on the basis of gender, investment experience, personality traits including extraversion, openness to experience and emotional stability, spontaneous decision-making style. The research findings do not provide significant evidence that there are differences in the performance of individuals on a risky choice task such as Iowa gambling task (which is considered to be very close to real world risky decision making under uncertainty) on the basis of their financial risk tolerance because the main effect is not significant however there was a significant interaction found between the blocks and financial risk tolerance categories which implies that in our sample risk tolerance did significantly influence the performance of the individuals. On the other hand, the research shows that there was no

relation of the risk taking calculated using Balloon Analogue Task with both financial risk tolerance and Iowa gambling task therefore it might be useful to use some other measure of impulsivity to explore the relationship between financial risk tolerance and impulsivity to see if the results are different. There was no significant relationship found of balloon analogue risk task and financial risk tolerance and with Iowa gambling task which indicates that the task measures risk taking from a different dimension not in line with the other measures of experimental or self-reported measures of risk. The deck B selection was found to be related to financial risk tolerance which means high risk tolerance and choosing from this high risk/ high return deck is more likely to be done by high risk tolerant individuals. The high risk tolerant individuals also tend to select less cards from deck D (low risk/ advantageous) as compared to low risk tolerant ones. However, there were no significant differences in the overall gambling task score (C+D)-(A+B) for financial risk tolerance.

The financial risk tolerance score is predicted by gender, financial literacy score, spontaneous decision-making style, extraversion and investment experience. 28% of the variation in financial risk tolerance score is because of the predictor variables. The financial risk tolerance score increases with the investment experience but when the experience increases more than 5 years the financial risk tolerance tends to decrease therefore it does not rise beyond a certain level.

6.2.2 Financial Literacy (Basic and Advanced, Perceived and Actual) and Risky Decision Making

The 71% of the respondents were high financially literate meaning they had a financial literacy score higher than 5. The mean of male respondent's financial literacy score was 8 and for females the mean score was 6. 87% of the male respondents had high financial literacy while for females 58% had high financial literacy. The male respondents had higher basic and advanced financial literacy as compared to the female respondents. The basic and

advanced financial literacy also differed for different age groups. The advanced financial literacy was found to differ among education levels while basic financial literacy differed among the different employment status. The more experienced investors had higher basic and advanced financial literacy thus meaning that experience does increase financial literacy as hypothesized. The mean for more than 5 years' investment experience for basic financial literacy was 2 and for advanced financial literacy was 6 while for the no investment experience the basic financial literacy the mean was 1 and for advanced financial literacy was 3. The advanced financial literacy was also significantly different among the investment instruments the respondent had invested in the investors who had invested in mixed mutual fund had mean score of 7 as compared to the ones who had only investing experience in current accounts who had a mean score of 5. Advanced financial literacy had a significant correlation with openness to experience and negative relationship with neuroticism thus if an individual does like to try new ways of doing things and does like to experiment it is likely that he/she would increase his/her financial literacy. On the other hand, neuroticism (being moody, depressed, not self-confident) would not lead to improving one's advanced financial literacy which is calculated by measuring investing concepts related to mutual funds, bonds, stocks and risk diversification. The more risk tolerant individuals have higher basic and advanced financial literacy scores the basic financial literacy for the high risk tolerant individuals was 2 and advanced financial literacy was 6 while for the low risk tolerant individuals the basic financial literacy was 1.7 and advanced financial literacy was 4. Basic financial literacy was found to have a negative correlation with deck B selection which is a disadvantageous deck from which if selections are made it leads to losses and thus basic financial literacy if higher the individuals are more likely to not select from this deck. There was no relationship of balloon analogue risk task variables (explosions, average pump count) and basic and advanced financial literacy.

Therefore, the risk-taking trait of impulsivity is not related to having more or less basic and advanced financial literacy.

The chi square test of association was calculated for perceived financial knowledge and actual financial literacy which was moderately strong indicating association of the two variables. The Pearson correlations for the two variables was calculated which was weak positive as compared to the previous research's (Agnew and Szykman, 2005; Hung et al., 2009; Parker et al., 2012) which have identified a moderate relationship. Pearson correlation was calculated for all the demographic groups between actual financial literacy and perceived financial knowledge which ranged from 0.2-0.7 and did not exceed 0.7, Agnew and Szykman (2005) reported a range of correlation 0.10 to 0.78 which is similar to our range. Parker et al. (2012) reported a moderate correlation of 0.366 perceived financial knowledge which they termed as confidence-knowledge with financial knowledge/literacy. Therefore, both perceived financial knowledge and actual financial literacy are not the same and financial literacy should be calculated not self-reported by the respondent.

There was a significant moderate relationship between investment experience and actual financial literacy while weak relationship with perceived financial knowledge based on Pearson correlations. The one-way ANOVA calculations for financial literacy score differences based on the financial risk tolerance and investment experience categories showed significant differences. High financial risk tolerant individuals were found to be the ones more financially literate as compared to the low risk tolerant ones this is in contradiction with the findings of Cameron et al. (2014) who found that students with lower financial risk tolerance applied financial literacy concepts when making decisions as compared to students with high risk tolerance. The more number of years of investment experience as compared to no investment experience was found significantly related to

higher financial literacy score thus confirm the idea of 'learning by doing' given by Lusardi (2008) and financial literacy being affected by financial behaviour by van Rooij et al. (2011). Our research also found that the perception of financial knowledge being more was significantly related to higher financial risk tolerance score and financial literacy score.

There was significant learning effect in performance of Iowa gambling task performance of the same level of perceived financial knowledge and actual financial literacy. Thus it can be concluded that respondents who are overconfident about their financial literacy (high perceived financial knowledge and low actual financial literacy) and the ones who underestimate their financial literacy (low financial knowledge and high actual financial literacy) do not learn to make advantageous and better decisions. Asaad (2015) concluded that individuals with high financial knowledge /literacy and high confidence tend to make better financial decisions as compared to the individuals with both low financial literacy and perceived financial knowledge. There was no relationship between any financial literacy or financial knowledge variables and balloon analogue risk task.

Financial literacy score was found to be predicted by gender, financial risk tolerance score, rational/vigilant decision-making style and intuitive decision-making style. The 37% variation in financial literacy score is due to the predictor variables. Intuitive decision-making style is a negative predictor of financial literacy score thus if individuals tend to make decisions based on intuition it is likely that they would have low financial literacy score. Making decisions based on facts and more rationally as compared to making them based on hunch helps improve the financial literacy score.

6.2.3 Risky Decision-Making Task Performance

The Iowa gambling task is based on risk and return trade-off as some decks are riskier and pay off more while others are less risky and payoff less profits this risk and return trade-off is the basis of financial investment theory that is why financial knowledge and investment

experience have been considered as important variables in this study. If an individual has higher level of financial knowledge, then it should have been easy for him/her to learn from the task risk and reward pattern that high risk may lead to high return/high loss. On the other hand, investment experience and financial risk tolerance would also be factors influencing the individual's choice of cards. Investment Experience and other demographic variables did not influence the Iowa gambling task performance. Investment experience was found to be significantly related with selection from the deck C advantageous deck. While more perceived financial knowledge was found to be related to more selection from the disadvantageous risky deck B which is according to what was suggested by Parker et al., (2012) that the confidence in one's abilities may reduce hesitation and increase the tendency of taking risks. Conscientiousness was the only personality trait related to card selection differences. Conscientiousness, openness to experience and emotional stability were found to be related to more number of years' investment experience.

The three assumptions of healthy performance on the Iowa gambling task as mentioned by Bechara et al., (1994) were proved to be invalid by Steingroever et al., (2013). The frequency of losses effect suggests that the participants prefer the decks (B and D) with infrequent losses over the decks (A and C) with frequent losses. Three studies of healthy participants did show the frequency of losses effect and chose more from the decks B and D while three reported more selections from decks B, C and D and an avoidance of deck A. In our study the healthy participants did learn to choose more from the decks C and D but also kept choosing from deck A and avoiding deck B so the frequency of loses effect which contradicts with the assumptions of healthy performance was not proved by our research. The second assumption was that healthy participants generally prefer good decks and are consistent in their performance between groups. In this study, the 244 healthy participants did not show overall preference for the good decks (C and D) as the bad decks

vs good decks selections were 52.6% vs 47.39% selections. Four out of the eight studies of the healthy participants reviewed reported that more than 45% of the participants chose more than 50% of the cards from the bad decks in our case this percentage is 55.7%. The third assumption is of not switching between bad and good decks in the final blocks of the task it is assumed that the exploration in the early trials lead to exploitation in the later thus switching between decks should be minimal. In this study, this assumption also proved to be invalid.

The prominent deck B phenomenon as mentioned by researchers (Lin et al., 2009; Lin et al., 2013) was not confirmed in our study. This phenomenon suggests that the normal individuals are attracted by short term gains as compared to long term expected value and thus are more likely to make selection of cards from this disadvantageous deck because it gives profits in short term. The highest percentages of cards were selected from the deck A and not from B although both of these are disadvantageous decks. The significant correlation of deck B and financial risk tolerance does give us some relevant information about the deck B phenomenon and thus it seems that the individuals who are more risk tolerant tend to choose from this deck because it does give short term gains. The significant correlation of the deck C with investment experience and the finding that more experienced investors tend to choose from this deck may be helpful to conclude that investment experience is helpful in making advantageous choices in the task.

Ferrey and Mishra (2014) found that men were more impulsive than females but in our study, there were no significant differences in risk taking trait of impulsivity of both the genders. It seems that BART as a behavioral task measuring risk taking and impulsivity explores a different dimension of the trait which is not in line with financial risk tolerance and gambling task risk assessment this finding of our study is also reported by Xu et al.

(2013) as in the first session no relationship among BART and Iowa gambling task were found.

6.3 Contributions

Financial literacy has not been investigated widely in United Kingdom as opposed to other countries and its relationship with financial risk tolerance as well as perceived financial knowledge is also very important contribution of this study. Further it investigates how different levels of perceived financial knowledge and actual financial literacy are related to Iowa gambling task performance. This study provides some evidence that financial knowledge, investment experience and financial risk tolerance are related to certain decks as compared to others and to some extent influence the gambling task performance but were not found to be related to the risk-taking task Balloon analogue risk task (BART). 44.3% of our participants performed normally on the gambling task and learned to choose advantageously while 55.7% did not improve their performance and failed to learn to make better choices. The total 244 participants comprised of self-employed, professional investors, finance students, workers employed for wages and retired individuals who were aged between 18 to over 65 years. Another study by Glicksohn et al. (2007a) on 61 undergraduate students reported that majority of the individuals 46% did not perform well on the task and only 54% learned to make better decisions eventually in our study the 55.7% did not perform well which is a massive number of participants who made impaired decisions. The individual differences such as gender, financial risk tolerance, financial knowledge and investment experience were explored to find the reason of bad performance but no significant results were found except for main and interaction effect of investment experience. The relationship of some variables had not been studied earlier for example how decision making styles are related to financial risk tolerance score and financial literacy score and how the Iowa gambling task performance is related to investment

experience, financial literacy and financial knowledge. The study of these variables and their relationships provides us with interesting results such as the relationship of rational decision-making style and financial literacy if an individual wants to increase his/her understanding of financial literacy he/she should gather relevant information and do research whenever making financial investment decisions. This will increase their financial literacy and in the long run financial behavior will be improved as the perceived financial knowledge and financial literacy if both are high better/ advantageous decisions can be made.

The performance of the healthy participants has been required to meet certain assumptions which are invalid in the case of many studies including this one. This may be due to the fact that these assumptions consider all healthy participants to be performing in a certain homogenous manner. This study had a very diverse sample of participants with wide range of age, education, occupation, financial knowledge and investment experience. The results show that even though the participants do learn to make better selections but still majority of them display impaired performance. The assumptions for healthy performance should be evaluated carefully when applied to healthy participants in such a way that the individual differences are also incorporated.

6.4 Recommendations

This research provides useful insights for financial advisors which can be utilized while assessing financial risk tolerance of a client. It has been found that financial literacy and investment experience both should also be taken into consideration because they do predict the financial risk tolerance score. Financial literacy score was found to be significantly predicted by rational decision style therefore in order to improve the financial understanding of investors/individuals it is recommended that as compared to intuitive decision making proper research about investment options should be done. Because better

decisions are made when individuals are neither overconfident or underconfident therefore the investors should be aware of their actual level of financial knowledge. Therefore, it can be helpful for financial consultants to conduct a small financial literacy quiz to make the investor perceived financial knowledge at the same level as the actual financial literacy.

6.5 Limitations of the Study

During the initial stages of the data collection the idea was to invite students from Kingston university to participate on campus in uniform surroundings which was not possible because even on being paid for participation the students did not show any interest in participating. So, the research data was collected online through questionnaires and experimental tasks displayed to the respondents on their computers using a link sent to them through e-mail. Therefore, the data might have been influenced by each individual being in different and not controlled environment.

6.6 Aspects for Future Research

The research was conducted in United Kingdom with standard version of the laboratory version of the Iowa gambling task and Balloon Analogue risk task. Future research can be done considering two different countries such as done in financial literacy research and comparisons can be made as identified by this study Balloon Analogue risk task is not significantly related to other measures of risk it might be interesting to use other impulsivity measures to identify the effect of impulsivity not identified by this behavioral measure of risk taking.

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8 Appendix A: Questionnaire

Q1 Please read and complete the survey and tasks presented to you. It will take 20 minutes to complete them. You will be required to install inquist software which is a reliable and well known software and safe for your computer.

8.1 Consent Form

Q2 I understand that the research will involve being presented with questionnaires and experimental tasks

- ❍ *Yes*
- ❍ *No*

Q3 I understand that I may withdraw from this study at any time without having to give an explanation

- ❍ *Yes*
- ❍ *No*

Q4 I understand that all information about me will be treated as strictly confidential and that my name will not be mentioned in any written work arising from this study.

- ❍ *Yes*
- ❍ *No*

Q5 I understand that If I want to get my data excluded from the study I can contact the researcher before August 2017.

- ❍ *Yes*
- ❍ *No*

Q6 I freely give my consent to participate in this research study.

- ❍ *Yes*
- ❍ *No*

8.2 Demographic Questions (9 items)

Q7 What is your gender?

- ❍ *Male*
- ❍ *Female*

Q8 How old are you?

- *Under 13*
- *13-17*
- *18-25*
- *26-34*
- *35-54*
- *55-64*
- *65 or over* _____

Q9 What is your highest level of education?

- *No schooling completed*
- *Nursery school to 8th grade*
- *Some high school, no diploma*
- *High school graduate, diploma or the equivalent (for example: GED)*
- *Some college credit, no degree*
- *Trade/technical/vocational training*
- *Associate degree*
- *Bachelor's degree*
- *Master's degree*
- *Professional degree*
- *Doctorate degree*

Q10 What is your ethnicity?

- *White British (English/Welsh/Scottish/Northern Irish/British)*
- *White (Irish, European, traveller, Gypsy)*
- *Black (Black British, African, Caribbean)*
- *Asian (Asian British, Indian, Pakistani, Bangladeshi, Chinese, Japanese)*
- *Middle Eastern/Arab*
- *Mixed/Multiple heritage*
- *Other* _____

Q11 Employment Status: Are you currently…?

- *Employed for wages*
- *Self-employed*
- *Out of work and looking for work*
- *Out of work but not currently looking for work*
- *A homemaker*
- *A student*
- *Military*
- *Retired*
- *Unable to work*

Q12 How will you describe your level of financial knowledge?

- *None*
- *Little*
- *Some*
- *A Lot*

Q13 Among the following which would describe you:

- *Finance Student*
- *Investor*
- *Broker*
- *Other* _____

Q14 Which degree are you enrolled in?

- *Undergraduate*
- *Postgraduate-Taught (MSc)*
- *Postgraduate-Research (PhD)*

Q15 What is your current marital status?

- *Single, never married*
- *Married without children*
- *Married with children*
- *Divorced*
- *Separated*
- *Widowed*
- *Living w/ partner*

8.3 Financial Risk Tolerance Questionnaire (13 items)

Q16 In general, how would your best friend describe you as a risk taker?

- *a) A real gambler*
- *b) Willing to take risks after completing adequate research*
- *c) Cautious*
- *d) A real risk avoider*

Q17 You are on a TV game show and can choose one of the following. Which would you take?

- *a) £1,000 in cash*
- *b) A 50% chance at winning £5,000*
- *c) A 25% chance at winning £10,000*
- *d) A 5% chance at winning £100,000*

Q18 You have just finished saving for a "once-in-a-lifetime" vacation. Three weeks before you plan to leave, you lose your job. You would:

- *a) Cancel the vacation*
- *b) Take a much more modest vacation*
- *c) Go as scheduled, reasoning that you need the time to prepare for a job search*
- *d) Extend your vacation, because this might be your last chance to go first-class*

Q19 If you unexpectedly received £20,000 to invest, what would you do?

- *a) Deposit it in a bank account, money market account, or an insured CD*
- *b) Invest it in safe high quality bonds or bond mutual funds*
- *c) Invest it in stocks or stock mutual funds*

Q20 In terms of experience, how comfortable are you investing in stocks or stock mutual funds?

- *a) Not at all comfortable*
- *b) Somewhat comfortable*
- *c) Very comfortable*

Q21 When you think of the word "risk" which of the following words comes to mind first?

- *a) Loss*
- *b) Uncertainty*
- *c) Opportunity*
- *d) Thrill*

Q22 Some experts are predicting prices of assets such as gold, jewels, collectibles, and real estate (hard assets) to increase in value; bond prices may fall, however, experts tend to agree that government bonds are relatively safe. Most of your investment assets are now in high interest government bonds. What would you do?

- *a) Hold the bonds*
- *b) Sell the bonds; put half the proceeds into money market accounts, and the other half into hard assets*
- *c) Sell the bonds and put the total proceeds into hard assets*
- *d) Sell the bonds, put all the money into hard assets, and borrow additional money to buy more*

Q23 Given the best and worst case returns of the four investment choices below, which would you prefer?

- *a) £200 gain best case; £0 gain/loss worst case*
- *b) £800 gain best case; £200 loss worst case*
- *c) £2,600 gain best case; £800 loss worst case*
- *d) £4,800 gain best case; £2,400 loss worst case*

Q24 In addition to whatever you own, you have been given £1,000. You are now asked to choose between:

- *a) A sure gain of £500*
- *b) A 50% chance to gain £1,000 and a 50% chance to gain nothing*

Q25 In addition to whatever you own, you have been given £2,000. You are now asked to choose between:

- *a) A sure loss of £500*
- *b) A 50% chance to lose £1,000 and a 50% chance to lose nothing*

Q26 Suppose a relative left you an inheritance of £100,000, stipulating in the will that you invest ALL the money in ONE of the following choices. Which one would you select?

- *a) A savings account or money market mutual fund*
- *b) A mutual fund that owns stocks and bonds*
- *c) A portfolio of 15 common stocks*
- *d) Commodities like gold, silver, and oil*

Q27 If you had to invest £20,000, which of the following investment choices would you find most appealing?

- *a) 60% in low-risk investments 30% in medium-risk investments 10% in high-risk investments*
- *b) 30% in low-risk investments 40% in medium-risk investments 30% in high-risk investments*
- *c) 10% in low-risk investments 40% in medium-risk investments 50% in high-risk investments*

Q28 Your trusted friend and neighbour, an experienced geologist, is putting together a group of investors to fund an exploratory gold mining venture. The venture could pay back 50 to 100 times the investment if successful. If the mine is a bust, the entire investment is worthless. Your friend estimates the chance of success is only 20%. If you had the money, how much would you invest?

- *a) Nothing*
- *b) One month's salary*
- *c) Three month's salary*
- *d) Six month's salary*

8.4 Financial Literacy Questionnaire (11 items)(Fernandes et al., 2014a)

Knowledge of Inflation

Q29 Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy:

- *a) more than today with the money in this account*
- *b) exactly the same as today with the money in this account*
- *c) less than today with the money in this account*
- *d) Don't know*
- *e) Refuse to answer*

Riskier: Stocks or Bonds

Q30 Do you think that the following statement is true or false? "Bonds are normally riskier than stocks."

- *a) True*
- *b) False*
- *c) Don't know*
- *d) Refuse to answer*

Long Period Return

Q31 Considering a long time period (for example 10 or 20 years), which asset described below normally gives the highest return?

- ❍ *a) savings accounts*
- ❍ *b) stocks*
- ❍ *c) bonds*
- ❍ *d) Don't know*
- ❍ *e) Refuse to answer*

High Fluctuations

Q32 Normally, which asset described below displays the highest fluctuations over time?

- ❍ *a) savings accounts*
- ❍ *b) stocks*
- ❍ *c) bonds*
- ❍ *d) Don't know*
- ❍ *e) Refuse to answer*

Risk Diversification: Spreading money among different assets

Q33 When an investor spreads his money among different assets, does the risk of losing a lot of money:

- ❍ *a) increase*
- ❍ *b) decrease*
- ❍ *c) stay the same*
- ❍ *d) Don't know*
- ❍ *e) Refuse to answer*

Knowledge of Mutual Funds

Q34 Do you think that the following statement is true or false? "If you were to invest £1000 in a stock mutual fund, it would be possible to have less than £1000 when you withdraw your money."

- ❍ *a) True*
- ❍ *b) False*
- ❍ *c) Don't know*
- ❍ *d) Refuse to answer*

Q35 Do you think that the following statement is true or false? "A stock mutual fund combines the money of many investors to buy a variety of stocks."

- ❍ *a) True*
- ❍ *b) False*
- ❍ *c) Don't know*
- ❍ *d) Refuse to answer*

Numeracy/Knowledge of interest compounding

Q36 Suppose you had £100 in a savings account and the interest rate is 20% per year and you never withdraw money or interest payments. After 5 years, how much would you have on this account in total?

- *a) More than £200*
- *b) Exactly £200*
- *c) Less than £200*
- *d) Don't know*
- *e) Refuse to answer*

Knowledge of Mutual Funds

Q37 Which of the following statements is correct?

- *a) Once one invests in a mutual fund, one cannot withdraw the money in the first year*
- *b) Mutual funds can invest in several assets, for example invest in both stocks and bonds*
- *c) Mutual funds pay a guaranteed rate of return which depends on their past performance*
- *d) None of the above*
- *e) Don't know*
- *f) Refuse to answer*

Bonds

Q38 Which of the following statements is correct? If somebody buys a bond of firm B:

- *a) He owns a part of firm B*
- *b) He has lent money to firm B*
- *c) He is liable for firm B's debts*
- *d) None of the above*
- *e) Don't know*
- *f) Refuse to answer*

Compounding

Q39 Suppose you owe £3,000 on your credit card. You pay a minimum payment of £30 each month. At an Annual Percentage Rate of 12% (or 1% per month), how many years would it take to eliminate your credit card debt if you made no additional new charges?

- *a) Less than 5 years*
- *b) Between 5 and 10 years*
- *c) Between 10 and 15 years*
- *d) Never*
- *e) Don't know*
- *f) Refuse to answer*

8.5 Personality Traits (44 items)

Q40 Please use the following rating scale to indicate the extent to which you agree with the following statements. I see myself as someone who.....

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Is talkative	❍	❍	❍	❍	❍
Tends to find faults with others.	❍	❍	❍	❍	❍
Does a thorough job.	❍	❍	❍	❍	❍
Is depressed	❍	❍	❍	❍	❍
Is original, comes up with new ideas	❍	❍	❍	❍	❍
Is reserved	❍	❍	❍	❍	❍
Is helpful and unselfish with others	❍	❍	❍	❍	❍
Can be somewhat careless	❍	❍	❍	❍	❍
Is relaxed, handles stress well	❍	❍	❍	❍	❍
Is curious about many different things	❍	❍	❍	❍	❍
Is full of energy	❍	❍	❍	❍	❍
Starts quarrels with others	❍	❍	❍	❍	❍
Is a reliable worker	❍	❍	❍	❍	❍
Can be tense	❍	❍	❍	❍	❍
Is ingenious, a deep thinker	❍	❍	❍	❍	❍
Generates a lot of enthusiasm	❍	❍	❍	❍	❍
Has a forgiving nature	❍	❍	❍	❍	❍
Tends to be disorganized	❍	❍	❍	❍	❍
Worries a lot	❍	❍	❍	❍	❍
Has an active imagination	❍	❍	❍	❍	❍
Tends to be quiet	❍	❍	❍	❍	❍
Is generally trusting	❍	❍	❍	❍	❍
Tends to be lazy	❍	❍	❍	❍	❍
Is emotionally stable, not easily upset	❍	❍	❍	❍	❍
Is inventive	❍	❍	❍	❍	❍
Has an assertive personality	❍	❍	❍	❍	❍
Can be cold and aloof	❍	❍	❍	❍	❍
Perseveres until the task is finished	❍	❍	❍	❍	❍
Can be moody	❍	❍	❍	❍	❍
Values artistic, aesthetic experiences	❍	❍	❍	❍	❍
Is sometimes shy, inhibited	❍	❍	❍	❍	❍
Is considerate and kind to almost everyone	❍	❍	❍	❍	❍
Does things efficiently	❍	❍	❍	❍	❍
Remains calm in tense situations	❍	❍	❍	❍	❍
Prefers work that is routine	❍	❍	❍	❍	❍

Is outgoing, sociable	❍	❍	❍	❍	❍
Is sometimes rude to others	❍	❍	❍	❍	❍
Make plans and follows through with them	❍	❍	❍	❍	❍
Gets nervous easily	❍	❍	❍	❍	❍
Likes to reflect, play with ideas	❍	❍	❍	❍	❍
Has few artistic interests	❍	❍	❍	❍	❍
Likes to cooperate with others	❍	❍	❍	❍	❍
Is easily distracted	❍	❍	❍	❍	❍
Is sophisticated in art, music, or literature	❍	❍	❍	❍	❍

8.6 Decision Making Styles (15 items)

Q41 Please use the following rating scale to indicate the extent to which you agree with the following statements.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
When making decisions I like to collect lots of information.	❍	❍	❍	❍	❍
I like to consider all the alternatives.	❍	❍	❍	❍	❍
I try to be clear about my objectives before choosing.	❍	❍	❍	❍	❍
I weigh the pros and cons of each option before I make a decision.	❍	❍	❍	❍	❍
My decision making requires careful thought.	❍	❍	❍	❍	❍
When making a decision, I consider various options in terms of specific goals.	❍	❍	❍	❍	❍
I often make decisions on the spur of the moment.	❍	❍	❍	❍	❍
I make impulsive decisions.	❍	❍	❍	❍	❍
I make decisions quickly.	❍	❍	❍	❍	❍
My decisions are spontaneous.	❍	❍	❍	❍	❍
When making decisions, I do what seems natural at the moment.	❍	❍	❍	❍	❍
When I make a decision, it is more important for me to feel the decision is right than to have a rational reason for it.	❍	❍	❍	❍	❍
When I make decisions, I tend to rely on my intuition.	❍	❍	❍	❍	❍
When making decisions, I rely upon my instincts.	❍	❍	❍	❍	❍
When I make a decision, I trust my inner feelings and reactions.	❍	❍	❍	❍	❍

8.7 Investment Experience Questions (3 items)

Q1 Among the following statement which describes your experience about investment instruments? Your knowledge is up to the level of…...

- *common banking products including current account or deposit account*
- *hedge funds or money market mutual funds*
- *bonds and mutual funds investing primarily in bonds*
- *mixed mutual funds*
- *equities/equity mutual funds*
- *exchange-traded derivatives*
- *OTC derivatives*

Q2 How many years have you been investing?

- *1 to five years*
- *more than five years*
- *Never*

Q3 What is your frequency of investing every month?

- *Less than Once*
- *Once a Month*
- *2-3 Times*
- *Once a Week*
- *2-3 Times a Week*
- *Daily*

Thank you for participating in the survey your time and effort is appreciated.

9 Appendix B: Information Sheet for Research Participants

Study Title

A study to investigate the impact of Financial Risk Tolerance and Impulsivity on Gambling Task Performance

Invitation paragraph

Before you take part in this experimental research it is very essential that you understand why the research is being conducted and what would be required from you. The study includes experimental tasks and survey questionnaire. It's a multidisciplinary research combining the knowledge of finance and the technology provided by neuroscience.

What is the purpose of the study?

The main purpose of the study is to help understand the investment decision making process.

Why have I been invited?

The experiment involves making use of financial concepts and understanding them is crucial that is why only students taking course in finance have been considered as participants.

Do I have to take part?

Participation in this experimental research is solely up to you and based on the information provided to you in this information sheet. You can withdraw at any time if you don't feel like continuing or get tired.

What will happen to me if I take part?

It will only take 30 minutes for participating in this research which includes filling questionnaires and participating in tasks. Your identity will not be disclosed at any point of the research neither if published or presented.

What are the possible benefits of taking part?

One benefit of participating in the research is that it will not only make you aware of new multidisciplinary research taking place but also provide insight about experimental research design which might be helpful. Moreover, as a thank you each participant of the research will be sent an amazon gift voucher worth at least £5 once the survey and task data is recorded.

Participant Details:

If you are interested in taking part in the research, please mention your e-mail address below. This will be used for sending you the link to the survey.

Email Address: _____

If you wish to know about any other aspect of the research or require further information, feel free to ask by sending an email to the following address:

Researchers name: Syeda Farheen Batul Zaidi

Researchers e-mail address: K1253047@kingston.ac.uk

Thanks a lot for your interest in the research and giving your valuable time.

10 Appendix C: Permission for using the Questionnaires

Permission for Using the Financial Risk Tolerance Questionnaire

John Grable <grable@uga.edu>

Tue 14/10/2014 13:59

Here is the original paper:

John Grable, Ph.D., CFP

Department of Financial Planning, Housing and Consumer Economics

University of Georgia

Visit the Financial Planning Performance Lab

Zaidi, Syeda F

grable@humec.ksu.edu

Sent Items

Dear Dr. John,

I am doing PhD at Kingston Business School and read your article "Financial Risk Tolerance and Additional Factors That Affect Risk Taking in Everyday Money Matters". Please can you send me the 13 item questionnaire so that i can use it along with an investment experiment for data collection.

Many Thanks.

Kind Regards,

Syeda Zaidi

Permission for Using the Financial Literacy Questionnaire

John G. Lynch <John.G.Lynch@Colorado.EDU>

Wed 30/04/2014 01:25Zaidi, Syeda FJohn G. Lynch <John.G.Lynch@Colorado.EDU>;daniel.fernandes@ucp.pt;dfernandes@rsm.nl

We would be pleased to have you use the instrument and to cite our paper.

John Lynch

Director of Center for Research on Consumer Financial Decision Making

Ted Anderson Professor

University of Colorado

Leeds School of Business, 419 UCB

Boulder, CO 80309-0419

Phone: 303-492-8413

Email: john.g.lynch@colorado.edu

Web: http://leeds.colorado.edu/lynch

On Apr 29, 2014, at 6:10 PM, Zaidi, Syeda F wrote:

Dear Researchers,

I am a PhD student at Kingston University London. I am doing research on Financial decision making and will also be considering financial literacy as a variable. I have read

the article ‘Financial Literacy, Financial Education and Downstream Financial Behaviors (full paper and web appendix)’. I am writing this e-mail to get permission for using the questionnaire of financial literacy. Please allow me to use it as a research tool in my study.

Regards,

Syeda Farheen Batul Zaidi

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11 Appendix D: Percentage of correct, incorrect, don't know and refuse to answer responses by the respondents

	Basic Financial Literacy					
Q1	Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy:	Correct	Incorrect	Don't Know	Refuse to Answer	
		68%	14%	15%	3%	
Q8	Suppose you had £100 in a savings account and the interest rate is 20% per year and you never withdraw money or interest payments. After 5 years, how much would you have on this account in total?	Correct	Incorrect	Don't know	Refuse to answer	
		64%	22%	12%	2%	
Q11	Suppose you owe £3,000 on your credit card. You pay a minimum payment of £30 each month. At an Annual Percentage Rate of 12% (or 1% per month), how many years would it take to eliminate your credit card debt if you made no additional new charges?	Correct	Incorrect	Don't know	Refuse to answer	
		31%	44%	23%	2%	
	Advanced Financial Literacy					
Q	Do you think that the following statement is true or false? "Bonds are normally riskier than stocks."	Correct	Incorrect	Don't know	Refuse to answer	
		56%	4%	39%	2%	
Q	Considering a long time period (for example 10 or 20 years), which asset described below normally gives the highest return?	Correct	Incorrect	Don't know	Refuse to answer	
		41%	24%	32%	3%	
Q	Normally, which asset described below displays the highest fluctuations over time?	Correct	Incorrect	Don't know	Refuse to answer	
		67%	7%	23%	3%	
Q	When an investor spreads his money among different assets, does the risk of losing a lot of money:	Correct	Incorrect	Don't know	Refuse to answer	
		56%	22%	20%	3%	
Q	Do you think that the following statement is true or false? "If you were to invest £1000 in a stock mutual fund, it would be possible to have less than £1000 when you withdraw your money."	Correct	Incorrect	Don't know	Refuse to answer	
		62%	7%	28%	2%	
Q	Do you think that the following statement is true or false? "A stock mutual fund combines the money of many investors to buy a variety of stocks."	Correct	Incorrect	Don't know	Refuse to answer	
		57%	2%	38%	2%	
Q	Suppose you had £100 in a savings account and the interest rate is 20% per year and you never withdraw money or interest payments. After 5 years, how much would you have on this account in total?	Correct	Incorrect	Don't know	Refuse to answer	
		64%	22%	12%	2%	
Q	Which of the following statements is correct?	Correct	Incorrect	Don't know	Refuse to answer	
		31%	11%	55%	3%	
Q	Which of the following statements is correct? If somebody buys a bond of firm B:	Correct	Incorrect	Don't know	Refuse to answer	
		44%	22%	32%	2%	
Q	Suppose you owe £3,000 on your credit card. You pay a minimum payment of £30 each month. At an Annual Percentage Rate of 12% (or 1% per month), how many years would it take to eliminate your credit card debt if you made no additional new charges?	Correct	Incorrect	Don't know	Refuse to answer	
		31%	44%	23%	2%	
Q	Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy:	Correct	Incorrect	Don't know	Refuse to answer	
		68%	14%	15%	3%	